Factory Management and Maintenance

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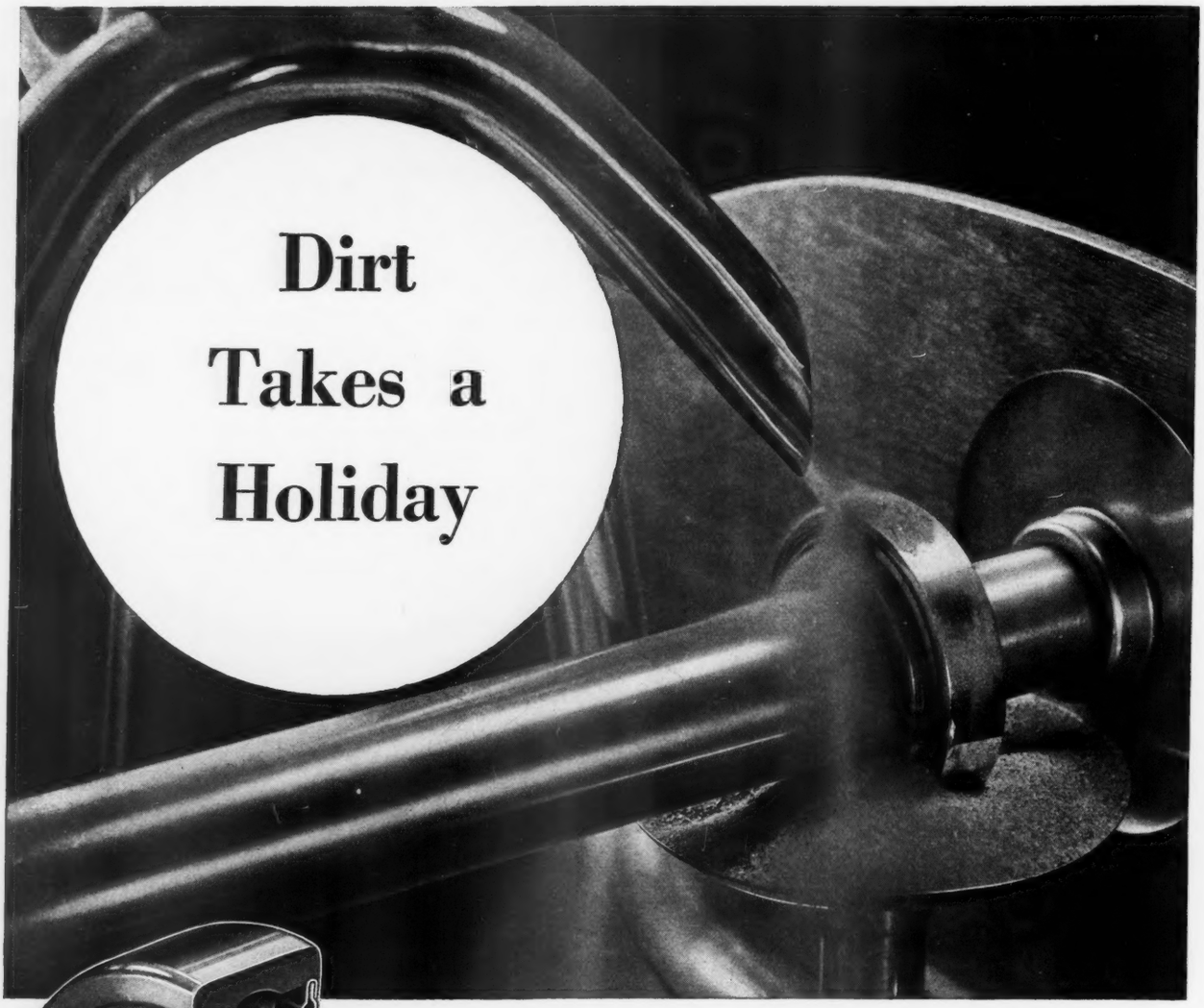
Dirt Takes a Holiday



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NOTHING ROLLS LIKE A BALL

Factory
Management and Maintenance
L. C. MORROW, EDITOR

Aren't These the Things Management Stands For?

NOW is an appropriate time to take stock as to the place of government in industrial relations. Congress, by adjournment, removes for the time being the possibility of further legislative control of relations between management and employees. CIO is indulging in a breathing spell. The Labor Relations Board is said to be engaged in introspection that will result in more nearly neutral behavior toward labor factions, including that great body of employees who do not want to join either CIO or AFL.

On the whole, things are quiet after a long period of fire and cross-fire with industry as the bystander, taking all the stray shots and many direct hits. We think that, out of it all, there are some conclusions which management can reach and stand upon, to its own satisfaction and benefit, and to the good of industry at large. We offer them in the hope that they can be presented by industry to the members of Congress in their own back yards or on their own front porches.

1. Management recognizes the right of employees to organize and to bargain collectively.

2. But management recognizes, also, the right of employees *not* to organize and their right to bargain individually.

3. Management recognizes the right of employees to strike, and their right to picket.

4. But management recognizes, also, the right of employees *not* to strike, their right to work, their right for protection in these rights, and the right for *peaceful* picketing only.

5. Management does not recognize the rights of employees or of bodies of people representing or alleged to represent them, to seize and occupy plant property.

6. Management believes that the National Labor Relations Board has the sole duty of administering the National Labor Relations Act, without prejudice to unions but also without prejudice to other types of employee organizations.

7. Management believes that the National Labor Relations Act should be amended to make it a law that will promote cooperation between management and labor.

8. Management deplores the chiseler who pays too little and works his employees too long, and admits the desirability of exploring the possibility of correcting the evil by means of wage and hour legislation.

9. But management believes that such legislation, if enacted, should be extremely simple and direct, that it should not establish an extensive bureaucracy, and that it should not create an all-powerful board to experiment with the economics and the destinies of industry.

These conclusions we submit as basic. We feel that eventually they must prevail if industry is to go ahead with its all-important job of making always more things for more people.

Caterpillar and CIO sign a statement of policies and practices. Left to right, Organizer Joseph Dernoncourt, B. C. Heacock, Caterpillar president, Joseph J. Vincent of the State Department of Labor

The Caterpillar Case History in Bargaining

Unique because negotiations were conducted in the presence of plant employees and the press, proceedings were taken down verbatim, later published as matters of record

ARTHUR VAN VLISSINGEN
Consulting Editor

IMMEDIATELY after the last presidential election, the management of Caterpillar Tractor Company learned that CIO organizers had come to town to organize Peoria. By the first of the year, it was apparent that the organizers were making some progress in signing up Caterpillar employees.

Some time in March, after making a telephone appointment, Joseph Dernoncourt and J. B. Price, first and second in command of the organizing forces, visited T. J. Connor, Caterpillar vice-president responsible for manufacturing. They asked for a meeting to negotiate an agreement, and presented a list of what they termed demands.

Connor, as representing the company management, received the demands for consideration. And by mutual consent, the conference between management and the committee from the CIO union—it happened to be the Amalgamated Association of Iron, Steel, and Tin Workers of North America—was set for Monday afternoon, March 22.

When the managing officers of Caterpillar met to talk over the situation among themselves, they were agreed on one major point of procedure. In every serious labor situation which had arisen recently, there had been in the newspapers all

manner of claims and counterclaims as to what had been agreed on in just such meetings as they were now committed to.

Avoid Secret Covenants

In such an atmosphere, the newspapers and the general public had been at least a little inclined to believe the employer was concealing or misconstruing the facts. How to avoid such a set of misunderstandings? Obviously, avoid secret covenants secretly arrived at. Keep an accurate record of every word said in the meeting, and have present people representing neither the management nor the union, to see just what went on.

The decision was to make the meeting as wide-open as was possible and to invite in the newspapers and employees. Employees selected would be of such character that their reports of the meeting would be listened to and believed by their fellow workers in the departments where they are best known.

The union had already presented its list of eight demands, in the brief meeting with Vice-President Connor. It was a foregone conclusion that it would now present some type of contract embodying these provisions. The people invited in from factory and office departments to witness the proceedings would hear these demands and take them back to their fellow workers. It therefore seemed appropriate for the company to use the same word-of-mouth medium to get on the record and into the minds of the workers a statement of its basic position.

The most basic of all facts necessary to an intelligent approach to any question of wages, hours, and working conditions is this, that wages are set and paid—not by the owners of the business, not by the management, not by the workers—but by the consuming public which buys the products of the company or, if it chooses, does not buy them.

Therefore it was decided to have a prepared statement of this sort read into the record. And it was decided to print a complete, verbatim account of the meeting as taken down by a court reporter, and to place this in the hands of every employee as soon after the meeting as feasible.

Along toward time for the meeting, the management requested some 125 people, representing about 40 different groups and departments, and including four AFL business agents, to come to the cafeteria for a meeting at a specified time, which was shortly before the time for its

Loyal workers waylaid the management group on their way back from their first inspection of the sit-down strike, half an hour after it was called. They wanted to throw the sit-downers out and get back to work. President Heacock (marked by arrow) is telling them to take it easy

opening. A few of them went direct to the executives' dining room.

When the four representatives of management—B. C. Heacock, president, and Vice-Presidents T. J. Connor, C. P. Holt, and A. T. Brown—and the eight members of the union committee, including CIO organizers Dernoncourt and Price, came in, they were seated in the executives' dining room, and mutual introductions were made for the benefit of the negotiators and the others present, while the rest of the departmental group came in.

Laying the Foundation

President Heacock stated the purpose of the meeting, which had been requested by the CIO. He told the identities of the departments, groups, and other unions represented in the people present at his invitation so that they and the newspaper men might have a full knowledge of the proceedings which were so important to the welfare of the entire community. Then he presented in simple, understandable form the basic facts of wage economics. He made a brief summary of Caterpillar's policies toward its workers.

Then, one by one, Mr. Heacock read the eight demands, and commented on them or supplied other pertinent information. For example, Item I was union recognition, sole collective bargaining rights for the CIO union, the customary stipulations about no discrimination, coercion, and the like. He stated Caterpillar's belief that its employees are entitled to join any organization, and the company's policy of not considering the subject of organization memberships in hiring or promoting.

He affirmed the company's willingness to discuss a man's or a group of men's employment with the employees or any representatives they may choose. He read into the record the telegrams of other labor unions calling attention to their position as authorized representatives of some of the company's employees and requesting that the company enter into no agreement to permit others to represent these unions' members. He reaffirmed the company's willingness to discuss employment conditions with any Caterpillar employee or his authorized spokesmen.

Item II was a minimum wage of $5 a day for an 8-hour work day, already in effect with a few exceptions.

Item III was an 8-hour day, a 40-hour week, time and one-half for overtime—all of these long-established policies at Caterpillar.

Item IV was "A standardization of wages in their own classification," which seemed to mean that the company should correct any hourly rates that were out of line with those of other workers on like jobs. He stated that the company is continuously at work on this task and would welcome any suggestions for finding any instances that need correction.

Item V was "A readjustment of the apprentice system now in effect." President Heacock explained briefly the apprentice system and its underlying philosophy, assured his listeners that only a lack of knowledge of what the company was doing here could have prompted a suggestion for readjustment of the system.

Still Other Requests

Item VI was a request for seniority rights, which has been the company practice for years.

Item VII was "A clearer understanding of the group insurance that has been forced upon us." He pointed out that the need of a much better understanding was testified by this request, since the insurance is not compulsory. It is merely available at bargain rates, nobody has to take it, but the adviser who persuades a workman not to take it or continue

(Continued on page 138)

CIO board of strategy holds an informal meeting during the strike. Organizer Dernoncourt in the center, the district head of the United Mine Workers at the extreme right

Sometimes Conciliators Can Settle

How the Department of Labor can help employers and employees settle their differences, as told by one of the Department's conciliators

CHARLES JOHNSON POST
Commissioner of Conciliation
United States Department of Labor

FROM VERMONT to Alaska, whether the contact be official or the informal brushing of elbows in a Pullman or business club, I have found a definite interest among business men in the United States Department of Labor—and also a very great degree of mystification as to its purposes and functions.

Sometimes there is a blanket hostility that, as in the case of a certain high official in a State Chamber of Commerce, reached the point of an actual, hysterical rage.

Sometimes the Department is confidently regarded—and sent for—by an employer, under the impression that it is a sort of strike-breaking Federal marshal who will tell the workers what they will have to work for and for how long each day. But, with growing frequency, there are employers who know it for the actual services it has rendered them, as well as their workers, and who unhesitatingly turn to it when serious differences appear.

Department Is 24 Years Old

Congress established this department in 1913 and enacted as its basis and functions the purpose "to foster, promote, and develop the welfare of the wage earners of the United States, to improve their working conditions, and to advance their opportunities for profitable employment." Yet, not so long ago, a group of employers told a Department Commissioner of Conciliation to get out of town because he was not helping them to get their own uncompromising terms accepted; for this same group has hired an *agent provocateur*, tapped official Government messages, and thirty arrests had been made to synchronize with the Commissioner's arrival and add to the dramatic effect that the Labor Department was their ally. Incidentally the strikers, impressed, had seriously talked over throwing the Commissioner into the creek upon his arrival.

In the 24 years of its existence the United States Department of Labor has developed from a little committee within the Department of Commerce into an efficient and extensive organization functioning in many fields besides that of strike adjustments.

Its Children's Bureau gathers and analyzes information in relation to child labor and the welfare of families in the lower income brackets.

The Bureau of Statistics is the basis for statistical information on all phases of working conditions and economic activity affecting the wage earner.

The Women's Bureau covers the field of wage-earning women.

The Employment Service covers the field of occupational service placements and research in that domain—last year (1936) it placed over 5,750 wage earners.

The Division of Labor Standards covers a field of working conditions, their laws, safety, occupational disease, and the functioning of the States in these fields.

The Immigration and Naturalization Service is what its name implies—over 313,000 petitions for naturalization were made in the past year (1936).

Then, also, there is the Department of Conciliation. This is the active diplomatic and labor adjustment service that is in the field wherever there is labor trouble and employer-employee disputes. It covers the States and territories and operates through Commissioners who, while more or less in one area, can be and are sent to any situation where the special emergency requires it.

These Commissioners, curiously and contrary to the rather general employer impression, have no definite power whatever. Their powers reside in both the employer and employees and can grow to any degree that may be mutually conferred upon them. Arbitration is not infrequent.

Why No Police Power

And the reason for this absence of authoritative power is quite reasonable: Assume that a Commissioner *did* have power of some kind. The employer would not be only hesitant but afraid to walk freely—he would be afraid of some commitment that might plague him; he would send for his legal counsel, and conciliation or mediation would immediately be frozen into frigid, legalistic grooves. The same is true on the union's side; and it too would be cautious and secretive. But, without this fear of some authoritative power and action, both sides will talk more freely—sometimes it is amazing how freely.

And from such freedom in conferences, the Commissioner can gage *first*, how many ghosts and phantom fears are in the mind of the employer in regard to a union relation of any kind; and, *second*, how far apart both sides are in terms; and, *third*, whether there is any possibility of compromise and in what ways; and, *fourth*, whether any bargain at all is possible and how rockribbed and

adamant either or both sides may be. In general the union will compromise or arbitrate; and equally in general, the employer will not, even in matters that involve neither wages nor hours. Once only have I known a union to reject either compromise or arbitration in a situation that justly called for both; but, lest the reader become too much stirred up over it, I can add that the employer had a record of pin-money wages and dealing himself all the aces up to that time.

Ordinarily only the first three phases above are involved, for most employers are fair—where their fears are not involved; and reasonable—though their first reaction is intense indignation over the unreasonableness of *any* change, and their fear of the unreasonableness of *any* union. But, when they actually meet a union committee or representative face to face and begin to bargain, then the ghosts and the phantoms and the fog blow away quite briskly and the road to agreement opens up. The foregoing is quite true either before or after a strike has developed. Most strikes can be avoided (except when the employer desires an actual test of strength) where there is at least fairness and reasonableness free from the mere hatred of a union as such.

Conciliators Advise Employers

Many employers have actually, and unwittingly, developed strikes by their bland belief that "they were all one happy family"—just because they knew James Smith and Sarah Hoch and Michael Wojinski by sight and they smiled back when the boss called them Jim and Sadie and Mike. One definite thing that a Commissioner can do is to advise an employer whether he will have a strike on his hands or not. This is advice he cannot get from his foremen or hired under-cover agents; the former do not know how to guess and will yes-yes the boss, and the latter will always assure him that there will be a strike and that he, the boss, needs everything from tommy-guns to faithful yeggs—his fears are their grist.

And, when a strike comes, invariably the employer's first description to the Commission is: "And then they walked out on me without warning!" The story by the employees' representatives is quite different: "We tried to see the boss; he'd put us off on the super—and the super would meet all we wanted and always tell us he had no power but would tell the boss. It was just a run-around. He was told there'd be a strike—plenty."

If the Labor Department is sent for before the strike—particularly if by the employer—in most cases no strike occurs and there is no halt in production. Negotiations go along hand in hand with production; the wage earners feel that negotiations themselves mean fairness.

In the year 1936 there were 1,012 cases of labor disputes laid before the Department of Conciliation. Of these 828 were adjusted and settled—over 81 per cent. In 115 cases no adjustment was possible; 36 were pending when the year closed, and 56 were unclassified, including cases in which the Department had been called in but which were afterward dropped or action was deferred, operations were suspended, threatened strike or lockout was called off or they were otherwise closed without departmental assistance.

Conciliation Record

The number of wage earners affected by these labor disputes (and a labor dispute means a strike in action or impending) is too important in our productive energies to be embedded in the foregoing. For the cases cited it is given in detail in the accompanying table.

During the past 21 years there has been a total of 14,879 cases of labor disputes laid before the Department, and 11,410 of these have been adjusted—about 76 per cent.

In the last phase referred to, i.e., *fourth*, in regard to the rock-ribbed and adamantine situations, the "no compromise" attitude rarely has to do with business reasons—business reasons in the domain of dollars and cents as to wages and hours. Quite frequently that can be adjusted.

Summary of Workers Affected, 1,012 Cases By Months (1936)

Month	*Workers Affected*	
1935	*Directly*	*Indirectly*
July	58,814	6,740
August	43,178	11,142
September	457,977	6,678
October	12,474	31,431
November	33,687	17,178
December	9,330	7,679
1936		
January	21,940	11,552
February	20,868	5,829
March	27,296	15,929
April	25,591	20,979
May	35,731	29,965
June	38,576	13,960
Total	785,462	179,062

1. Do I have to recognize any man or any committee claiming to represent my employees? **No. You have the right to challenge such claim—your position is a matter of policy, however, best to be determined in the light of other factors.**

2. What is involved if I refuse such recognition? **Such claimant is forced to demand a shop election of the National Labor Relations Board to determine, by majority vote, the lawful representative of your employees. Also, you may have a strike if such refusal is a subterfuge or a technicality used to defer collective bargaining and the union is *de facto* and with membership.**

3. If an American Federation of Labor committee and a Committee for Industrial Organization both claim to represent my employees which

Since the Wagner Act was established by the United States Supreme Court I have heard it solemnly advanced in seriousness that a concession of substance has been made in agreeing to collective bargaining —quite regardless of the fact that there is no concession in doing what the law requires. Prior to this such employer would deal only with his own employees as individuals—men unaccustomed to bargaining, fearful of being discharged, where even a shop committee of them had no more chance of "bargaining" than does the well known paraffin cat in the furnaces of Sheol.

The employers in this general class—approximately 11 per cent in the Department's 1936 classification —do not regard the relations with their employees as a matter of buying so much labor for so much wages, as they would buy from any other group. They seem to regard it fundamentally as a matter of sentimental relations between employer and employee, or, in legal verbiage, the relation "between master and man." No one—not even a Commissioner—can argue in matters of sentiment; there is no crevice in which logic may find a foothold; any effort at discussion simply creates a morass in which economics and old sentimentalisms riot in a chaotic circle like a pinwheel on the 4th of July.

Relation to Employer

What is an employer's relation to the Department of Labor and its Department of Conciliation? The same as that of the employees.

The employer may call upon the Department for aid; for information, analysis and advice—none of which he is *compelled* to follow, although many do. Why not a lawyer? Certainly, a lawyer, too—if the lawyer will be as impersonal as will be the Commissioner and not regard himself as simply the partisan of his client yes-yessing and adroitly blocking with immaterial technicalities. Personally, I like to meet with the counsel; yet few lawyers have made labor law or its development their field. Legal training lies chiefly in other directions.

I have seen a lawyer who came in at the eleventh hour—who personally was very hostile to organized labor and hated the very thought of union relations—attempt, with irritating unsubstantial technicalities and absurd logic, to wreck a union contract that was on the point of being signed by his client after fair negotiations in which the employer had shown he was friendly to the union.

In all cases where the employer does not want a fight the Department can be of service. It knows the employer's rights under the law —and what are not his rights. The Commissioner has many cases to draw upon for experience in any situation—he knows the errors of the past, both of employers and unions in matters of procedure. Employers know much more about their

(Continued on page 156)

Answers Employers Want

should I recognize? **Neither, under the law. The law does not give an employer any right to select, in his own judgment, but states that the employees themselves have the free right to make such choice themselves. An election must be held to determine. Do not play politics with one labor group against another—even if you don't know the gun is loaded.**

4. What does the term "closed shop" mean? **Nothing. There are so many degrees of union "closed shop" contracts that the term, by itself, means nothing. To some, any union recognition is a "closed shop."**

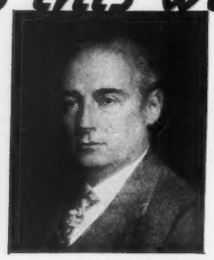
5. Do I have to recognize anyone, not in my employment, as a representative of my employees? **Yes, the law so states. Your employees make that choice for themselves, the same as you select your general agent or your lawyer.**

6. A strike is on; the employer fears that if he opens negotiations he will be looked upon as surrendering completely and losing his bargaining power. He is willing to negotiate fairly, but afraid to make the first move. What can be done? **Wire the Department of Conciliation, state the facts, and let a commissioner make the first move. He is neutral.**

7. Is the National Labor Relations Board part of the U.S. Department of Labor? **No. It was created by separate Act of Congress. When conciliation and mediation fail, or intimidations or coercions exist, or there are other denials or violations of the labor laws, this Board receives a complaint. It has power to summon and examine under oath and it means serious business. The friendly stage of mediation has passed.**

8. Many employers have raised wages in the past year; why is there still pressure for higher wages and fewer hours —not in terms of human capacity but as a matter of fair economics? **General foods have increased 57.5 per cent since 1933; meats have inincreased 84 per cent. Economies are possible in clothing and other items of living, but not in food; the food index is the critical element. With wage earners the food expense is a major item. They feel the pressure of need even if they are not, in any one shop, sufficiently and learnedly articulate on the economics involved.**

It's this way in Washington



Harris & Ewing

CARTER FIELD

Washington Correspondent

With Congress adjourned, members of the House and Senate have gone home to find out what their constituents are thinking, how they'll vote on election day. Whatever they learn, the Congress that meets in January is going to vote on questions of vital import to every business man, is going to be in a spending mood. And there will be plenty of legislation looking to the further regulation and hampering of business

WITH Congress adjourned until January — unless President Roosevelt should call an extra session this fall—there now comes a testing period. Actually, there will be 531 political test tubes under careful scrutiny by 531 persons, the same being the members of the House and Senate seeking to find out just what the folks in their districts and states think about things.

It is this testing process between sessions, far more than the shouting and tumult of the campaigns, and the frequent absurdity of election results, which makes this country's political system the nearest approach to a democracy the world has ever seen. In the regular campaigns and elections these same 531 persons are committed by national candidates, party platforms, organization tieups, all sorts of complications. The voters are confused by the multiplicity of issues, sectional ties, historic labels, and whatnot. There is sometimes a "paramount" issue. In short, a national election very seldom proves anything of very great value, except, sometimes, that a certain person is very unpopular at the moment.

An Important Period

But in the sort of period on which we are now embarking there is real influencing of the future policies of the country by the people, and never in the history of this country has there been a more important such period to every business man, every employer of labor, every taxpayer, in fact to everyone who has the future prosperity of his country at heart. It is scarcely an exaggeration to say that the continuance of the present form of government of the United States will be determined, mostly unwittingly, as a result of this present testing period.

During the months between now and January most of the senators and representatives will be at home. All of them will be finding out what the men and women who will vote for or against them in the next primary and election are thinking. Some of them consciously and patiently will be attempting the nearest approach to a scientific cross-section of what *their* home voters regard as important enough to control their own votes.

There are millions of less important voters whose opinions are heard with apparent deference and respect by the candidates—and as utterly ignored by them in shaping their own decisions as to the *safest* stand to take on issues.

The really influential chap—in this test tube period now under way —is the one who convinces his senators and congressmen that unless they vote the way he wants on some particular issue they are going to compel him—reluctant as he may be to change—to vote against them in the primary, or election, or both.

Just a few thousand men, owning sawmills and little factories in the South, prevented passage in the session just ended of the wages-and-hours regulation bill. More important than that, their attitude, vigorously conveyed to their senators and representatives, had produced a situation so clear that *Factory* was able to say in its last issue that the final draft would be conservative and not drastic. And this in the face of the fact that in the Senate it was Hugo Black, then a senator from Alabama and now a justice of the United States Supreme Court, who was chairman of the committee in charge.

These protesting Southerners had plenty of assistance from other sections, but they are the ones who accomplished the result. Hugo Black sensed the fact that he would be in real danger in the next primary unless he fought for a conservative bill. He realized the little mill and factory owners of Alabama were excited enough about this particular issue to vote against him in the next primary regardless of any other issue if he did not placate them.

Bearing in mind that it is the voters in each district who scare the representative from that district, and the voters in each state who scare the senators from that state (and that no senator or representative cares a whoop about the resolutions of any national organization of business men) it behooves the manufacturers and business men generally of this country to try a little scaring between now and January.

More Taxes on Business

The Congress that meets in January is going to vote on a lot of questions of vital import to every business man. There will be the postponed wages-and-hours bill, of course. There will also be a tax bill. Let's look at that just a minute. With primaries only a few months away, and election in November, Congress is not going to vote taxes that will irritate any considerable fraction of their constituents. But the Treasury will need a lot of money. So the time-honored formula will be to put this tax on business. President Roosevelt will agree with this theory, and in addition will seek to accomplish—as in the case of the tax on undistributed corporation earnings—social and economic reforms, and another step toward his ideal of government-controlled planned economy, through the taxation route.

Congress will also be in a spending mood, on the theory that lots of bacon brought home greases the path to renomination and reelection. The budget will have few friends.

There will be plenty of legislation looking to the further regulation and hampering of business, to say nothing of more government competition with private initiative.

So it looks like a little scaring of its political representatives by the folks who pay the bills is in order.

How's This for a Workplace?

It's just such a one as many a motion economist has been looking for. Built primarily for use in the classroom or in the laboratory, it has everything the good circular workplace should have, is adaptable to many practical uses in the shop

ASA S. KNOWLES
Head, Department of Industrial Engineering
Northeastern University, Boston

NO TERM is more familiar to the student of motion study than that of "circular workplace." Its principles are utilized in laying out factory work areas for machine and bench operations in both shop and methods engineering laboratory. Yet seldom do those who have to construct these areas utilize more than makeshift set-ups.

A makeshift set-up is never satisfactory; it cannot always provide conditions that even approximate the shop. At best it cannot always provide for the incorporation of such familiar principles as drop delivery, hopper feed, and adequate tray facilities for parts, to say nothing of flexibility of arrangement.

Most of these principles could be attained if the analyst could think out his problems in the shop, but there are few shops that want to tie up productive space while a methods engineer carries through a trial-and-error process for the determination of "the one best way."

Furthermore, in the classroom where methods engineering is taught to students, the familiar blackboard sketch of an ideal workbench is little more satisfactory than the attempt to create conditions similar to those encountered in the shop.

It Has About Everything

In recognition of these problems, I have developed a circular workplace that not only facilitates the teaching of motion economy, but also has sufficient flexibility to allow many practical arrangements.

The adaptability of this table can be seen by examination of the photograph. Note that the table has a double top to allow for the interchange of a plain semicircular work area with others possessing special tools and fixtures. The principle of drop delivery is provided by a chute having an opening on the surface of the table just back of the work area space.

Three complete, movable, and interchangeable tray sets make the arrangement of assembly parts and tools both simple and flexible. The rear tray sets are provided with metal trays, in the front part of which a piece of metal has been soldered to produce a "lip" for ease in grasping parts or materials.

These trays are supported on specially constructed wooden racks which tilt them. The tilted position makes possible a gravity feed of parts to the lip end of the tray, which is nearer the operator, and also facilitates the grasp operation in assembly jobs. If desired, however, the trays may be tilted at any point on the table by attaching a triangular shaped piece of metal to the back of the pan.

By Truck and Tractor

Handling highlights at Thompsonville, Conn., plant of Bigelow-Sanford Carpet Co., Inc.

BIGELOW-SANFORD, like every manufacturer, is in the materials handling business, so makes a business of handling its materials and finished goods in the most expeditious and economical way.

Where wool can be blown, as from washers to dyehouse, it is blown.

If it can best be distributed to storage bins via belt conveyor, a belt conveyor has the call. Or if heavy baskets must be moved from dyers to driers, an overhead rail is decidedly the thing.

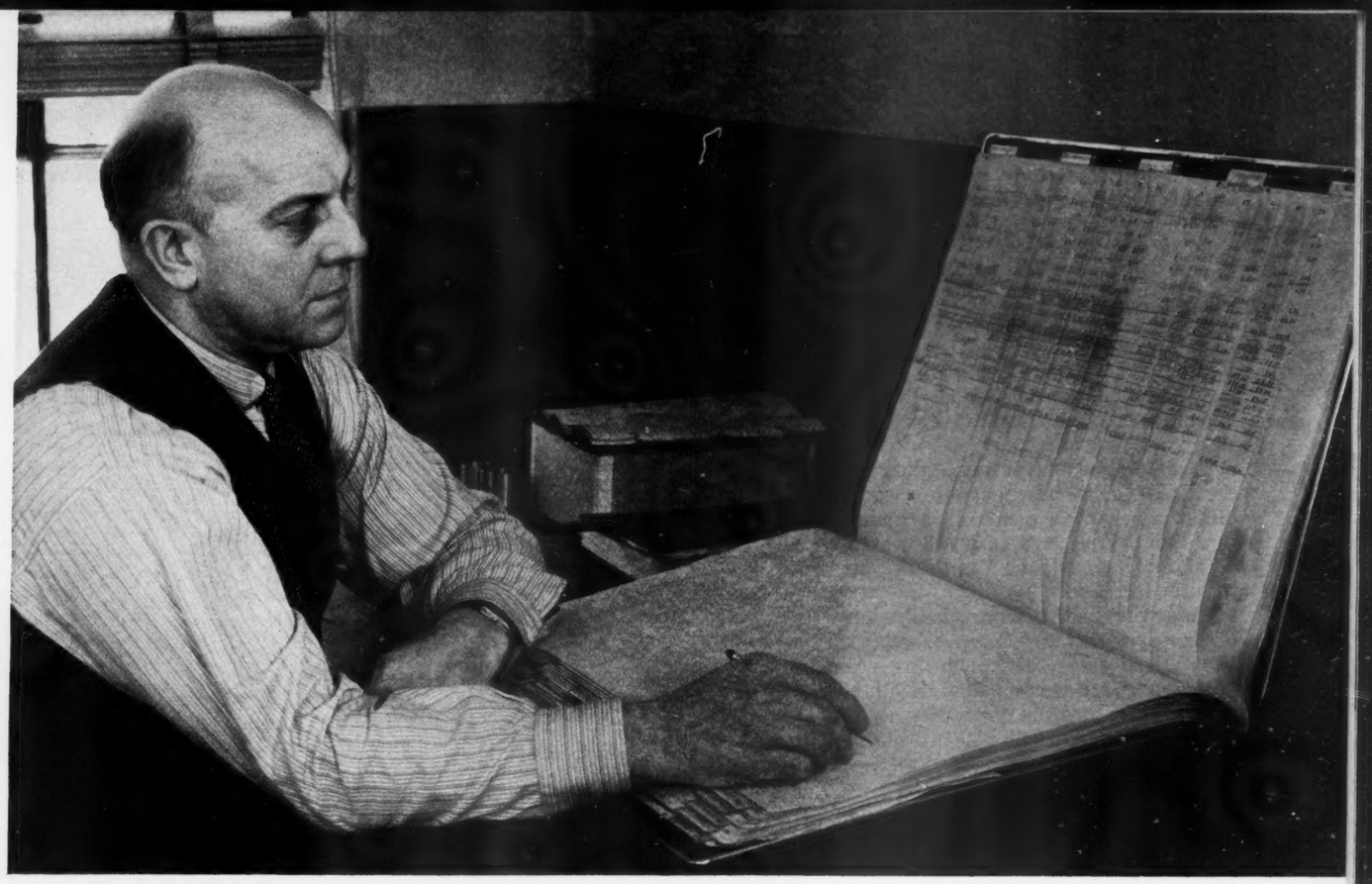
For the hundred and one other handling jobs that go to make up the day's work, power trucks and tractors get most of the business.

A tractor and trailer train, for example, handles finished carpet in and out of storage. See Figure 2. The carpet storehouse is ramped, so the "trackless train" can pass from floor to floor.

Similarly, an industrial tractor is used to move finished goods from rug finishing to re-inspection, baling, and storage.

This is, in fact, a two-way operation, because on the way back from the storehouse this tractor drops empty trailers in the colored yarn department, picks up loaded trailers (Figure 3), and heads for the Axminster winding and setting room. On its way there it has to negotiate a steep 250-ft. ramp between buildings.

Figure 1 shows a high-lift truck on location in the wool storage room piling bales four or five high.



Burden Under the Thumb

Ten hours a month with a single report gives this plant manager finger-tip control of indirect expense. He tightens up by "personalizing" every item

J. W. BRUSSEL
Works Manager
Federal-Mogul Corporation, Detroit

SOME 4,000 orders a month, from some 400 customers, for anywhere from one piece to 300,000 pieces, normally result in increases and decreases in production schedules. Control of indirect expense, both materials and labor, thus requires careful consideration in order that actual expenses may be maintained within the estimate made to secure the orders.

Bushings, bearings, barstock, and die-castings in a wide variety of sizes and compositions constitute our main output, although a substantial volume of marine products, such as propellers and copper cylinder heads, is maintained. The company works with 70 different kinds of metal, uses 2,875 different casting patterns and 500 different propeller patterns in its foundry work.

Within the past year and a half, volume has increased greatly, both in total and in diversity. It became evident that, if a satisfactory profit margin was to be maintained on this increased volume of business, a tightening-up was required all along the line.

In the foundry, for example, it was found that only two charges per hour were secured from the sand blast barrels because of the frequent stops to replace the 3-cent nozzles that were being used. Replacing these with nozzles costing several dollars each, but which lasted throughout the year, resulted in four charges per hour through elimination of down time. Then we found that, by using water tumbling barrels, a cheaper but nevertheless a better job resulted.

A quick answer to the problem of control here would probably be to set up a budget. Perhaps that is the correct answer. It must be remembered, however, that the rapid changes in releases, large orders and small ones, not to mention sample orders, make it virtually impossible to estimate accurately a month ahead either what the volume will be or its composition as to type of product.

Under such circumstances it was thought that changes would be so frequent that the budget as a control device would be inadequate. Such changes would of course involve considerable clerical labor in operating a budget, and this was to be avoided if a simpler scheme could be devised.

Ratios would be another ready answer—ratios of indirect expense by class to direct labor—either the direct labor hour, or the direct labor dollar. These are proper and serviceable mechanisms of control, but in this case a little better way of saying it would be that a "personalization" of each expense was

This is the monthly statement that the works manager gets from the accounting department. Such a record is made for each department. By analyzing them himself (see the table), the works manager soon sees what's out of line

desired. The supervisor is accustomed to dealing with people; to tell him that his scrap for the month is 5 per cent of productive labor does not carry the significance that is entailed in the statement, "For each direct worker in your department this month you scrapped $15 worth of material and labor," or whatever the true sum may be.

To accomplish this personalization of expense, only one form or report is required from the accounting department, and this is not an addition to the ordinary procedure of making up the regular monthly income statement.

Ten Hours for Analysis

To analyze this report and to appraise the performance of each supervisor in controlling his expense takes about ten hours per month of the works manager's time. Since he is the operating executive responsible for factory efficiency, such personal analysis leads to the discovery of situations and relationships which might be entirely overlooked were this analysis made by others, a clerk for example.

The statement prepared by the accounting department, with assumed figures for purposes of illustration, is shown on these pages. Such a record is made for each department each month. These statements are included side by side in a multi-ring binder and grouped by departments, one month overlapping the other with only the cumulative column showing. This permits the history of each department for the current month and the year to date to be easily arranged together for a study of trends in expense.

The payroll for productive workers is stated as shown together with the average hourly rate. The latter divided into the former gives the number of hours worked by each department during the month. If, for example, there are 21 operating days during the month and the plant works 8 hours per day, each operator working full time should have 168 hours to his credit. Dividing this sum into the number of hours worked by each department per month gives the number of men working full time. This method of

STORE BORER UNIT ANALYSIS PAT. PEND.

MONTH OF November 1936		%	ACC'T NO.	DESCRIPTION	%	YEAR TO DATE
13,067	84			DIRECT LABOR		
	71			Average Earned Rate		
				INDIRECT LABOR		
575	82		204	Assistant Foreman		
879	47		211	Job Setters		
1,455	29			SUB-TOTAL		
648	11		212	Set-Ups (Regular)		
188	37		213	Set-Ups (Service)		
			214	Change Acid, Tin & Pickle		
			215	Machine Delay		
			219	Tool Delay		
49	21		220	Excess Cost		
107	35		221	Lost Rate		
39	92		222	New Man Allowance		
24	19		224	Wait for Stock & Heat		
37	36		225	Tool Trouble		
57	79		227	Machine Trouble		
356	95		231	Rework Material		
			241	Make & Repair Tools		
117	79		242	Tool Grinding		
			251	Pattern Making		
			252	Pattern Maintenance		
			253	Pattern Alterations & Stand.		
			254	Pattern Experimental		
			295	Draftsmen		
			365	Shipping Clerks & Packers		
6	10		375	Truckers & Cleaners		
			387	Experimental		
7	20		399	Misc.		
3,095	63	24		TOTAL		
				PRODUCTION SUPPLIES		
			401	Acids & Chemicals		
			402	Cleaner		
			415	Flux		
			427	Plating Supplies		
				TOTAL		

calculation eliminates from subsequent analysis the variables that would result from some of the force working part time, or overtime.

Dividing every expense recorded by the accounting department by the number of full-time men in each department gives a figure which in each case is the number of dollars of indirect expense required to keep one direct worker going. Of course all supplies and tools used, repairs to equipment, and scrap reports are signed for by the foreman before these original cost records get to the accounting department.

If repairs to equipment are to be made, the order is signed by the foreman and, if over a certain sum, as would be involved in completely overhauling a machine, comes to the works manager, and a note of the amount is made on the burden statement as an aid in interpreting the accounting figures for the month.

Control of expense in this plan is a matter of elimination. The most important ones are worked on first. After bringing them into line by instituting proper remedial measures, others are attacked. A cost system will only indicate totals of expense and cost, but to express judgment as to their legitimate level requires someone familiar with what can be accomplished in manufacturing operations. In the long run, more precise control is possible if the maximum effort is expended at the incidence of the expense rather than a historical accumulation of what the expense was.

Details of Analysis

At present the results of the monthly analysis by the works manager are written on the back of the burden statement. See the table. The first item is the number of men, determined as stated above. This is followed by each controllable item of expense expressed in dollars per productive worker by department.

				GENERAL SUPPLIES & SERVICES	
148	09		441	Belting	
			467	Pipe & Fittings	
68	93		468	Gloves, Leggings, Rags	
			475	Melting Pots & Ladles	
149	84		478	Oils & Cutting Compounds	
			480	Pattern Metal	
2	51		484	Polishing Supplies	
			513	Freight & Express on Supplies	
2	55		559	Safety Appliances	
			561	Shipping Supplies	
			567	Stationery & Office Supplies	
			587	Telephone & Telegraph	
38	81		599	Misc.	
1,146	50		601-669	Perishable Tools	
			673	Patterns Purchased	
			695	Tool Alterations	
			699	New Tools	
1,557	23	12		TOTAL	
				MAINTENANCE	
35	85		705	Factory Operating Equip.	
536	19		731	Machinery	
734	17		751	Tools-Dies-Patterns	
			761	Buildings & Building Equip.	
38	54		796	Moving Machines & Equip.	
			799	Misc.	
1,344	75	10		TOTAL	
277	44	02	805	METAL CONTAMINATION	
941	58	07	813	SCRAP LOSSES	
				UNCLASSIFIED	
			811	Service Labor	
			845-851	Depreciation	
			957	Mileage Allow. to Employees	
			999	Misc.	
				TOTAL	
				RECOVERIES	
			807	Patterns Capitalized & Charged	
			811	Service Labor	
7,216	63	55		TOTAL BURDEN (Net)	

MACHINE DIV.
DEPT NO. 35
DEPT. NAME Tin-Base Machining

DEPARTMENTAL BURDEN STATEMENT
FEDERAL-MOGUL COMPANY
DETROIT, MICH.

Items entered will vary with the character of the work. The plating department, for example, will have no tool grinding expense although this will be an important item of the machining department. Moreover, the item set-up for the same department will vary from month to month depending upon the shift in the number of dollars expended per productive worker.

Typical Item

For example, "productive supplies" will normally be expressed in total per direct worker. If it should happen, and it frequently does, that this item shows a marked increase over the previous month's experience as shown by the previous month's burden statements, this total is further divided to locate the trouble. These divisions are: Acids and chemicals, cleaners, flux and plating supplies. The foreman is informed on what particular item he is exceeding previous performance. The difficulties and reasons are discussed. Plans are made to reduce the out-of-line expense. And that foreman's succeeding monthly performances are recorded until such time as they again parallel normal performance.

Past performance, the norm in budget determination, is in this plan shown at a glance on the overlapping monthly burden expense statements in the burden book for as many previous months as may be desired. An increase in output would of course increase the legitimate level of each item of controllable expense varying with output, but this is sufficiently provided for by working all items down to an individual productive worker. The larger the number of workers, the larger the expense, but the ratio per worker should remain constant.

A few illustrations of the results secured through operation of this plan may be illuminating. Money spent for cleaning compound in one department ran to a total of $750 per month; installation of a wash tank reduced this expense to $35. Seventy-two drills per day were used on one series of operations, but a change in the design of the jig and the purchase of a better drill brought consumption down to twelve. Consumption of perishable tools for the factory as a whole has been reduced by almost two-thirds, and productive supplies by almost three-fourths per productive worker compared with the performance of a year ago.

Scrap has been markedly decreased. Comparisons between the performance of different foremen in this respect are possible. The scrap produced should be the same per productive worker irrespective of variations in limits, since the foreman supervising close-limit work is provided with tools suitable for that kind of production.

It is perhaps obvious that one making the analysis described and praising or questioning supervisors on the basis of it, as the results may warrant, must have not only an historical record of what past performance has been, but he must have in addition a keen realization of what it may become. To tell a foreman that for each productive worker in his department, $60 was spent in supervision, individualizes the matter much more definitely than to tell him that his ratio was thus and so.

This, together with minute segregation of expense totals and attacking out-of-line items at their source results in a form of control that has proved its worth in a plant producing a variety of work with quick changes in schedules.

Analysis of Indirect Expenses per Productive Worker

Department 35 November, 1936	Productive Workers—102
Foreman and Set-Up	$20.62
Excess Cost, Lost Rate, Machine Trouble, and Tool Grinding	4.33
Truckers and Cleaners	4.66
Oil and Compound	1.47
Perishable Tools	11.24
Machine & Tool Maintenance	13.19
Rework	3.50
Scrap	9.23
General Supplies	2.56
Total per Productive Man	$70.80
Inspection Percentage per Productive Payroll	16.4

Industry Must Do Something About Its Syphilis

The man who, more than anyone else, is responsible for driving syphilis into the open, tells what one large concern has done, what all industry has to do

THOMAS PARRAN
Surgeon General
United States Public Health Service

AMERICA'S FIRST great demonstration in the control of syphilis was an industrial program. It was conducted by what was, in 1917, America's biggest industry—the War Industry.

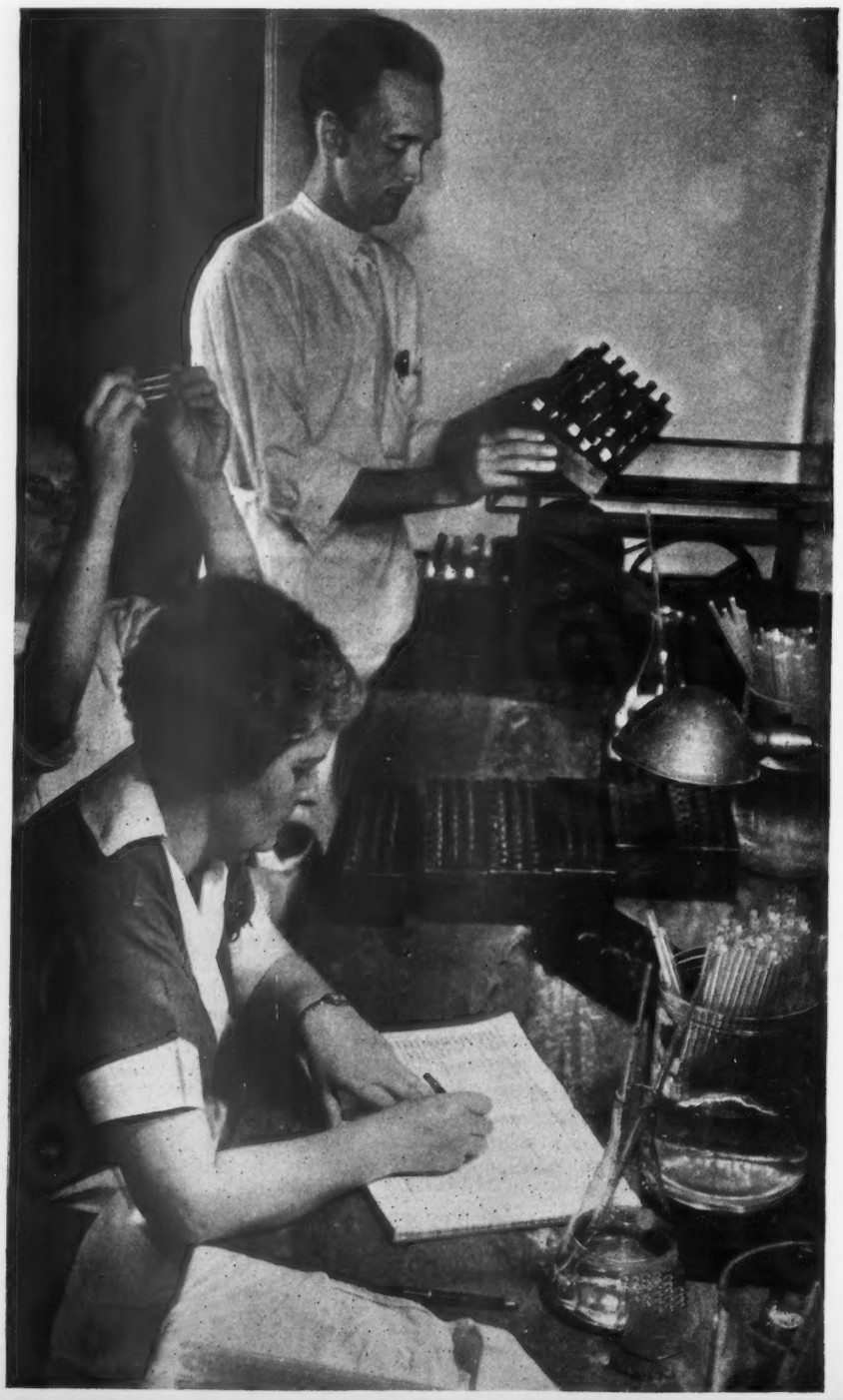
It had been only a dozen years since the germ that causes syphilis had been discovered, only ten since the blood test by which syphilis could be diagnosed had been developed by Wassermann. Salvarsan ("606"), the compound of arsenic that is the basis of modern treatment was a discovery of 1910.

Syphilis is one of the greatest disablers and killers. It is a slow, persistent, sullen sort of disease that saps the efficiency of men over a third of their lifetime before it strikes the death blow. Small wonder that in war time Uncle Sam determined to use the new medical weapons and stamp out syphilis among his military employees. Healthy armies go farthest.

How Serious in Industry?

So let us look at syphilis in other industry. Is it irrelevant or serious? What effect has syphilis on efficiency? On dependability? On the length of the working life? What does it mean to worker and management? The answer will differ for the three different stages of syphilis.

There is the first stage when sores appear on the skin. This stage presents the problem of infection. "Repression and anxiety may be justifiably regarded as the first loss to industry" in this stage. So suggests Dr. Joseph J. Eller in a recent article in *Industrial Medicine*, who thus describes the psychological state of the worker. "He reflects upon the seriousness of his condition; he ponders the outlook for a possible cure; he knows that the safety of his family is jeopardized;



Routine blood tests as part of every physical examination are basic in the Public Health Service's drive on syphilis. Here one technician reads the test tubes against the light, while another checks the results in the record

Treating it is a long process—but syphilis can be cured. Thirty injections of arsphenamine into a vein, forty injections of bismuth into a muscle, given continuously at weekly intervals, will kill the spirochete but not harm the person

and he wonders how the expense of treatment can be met."

All these considerations, save perhaps the financial, would equally unsettle the general manager under similar circumstances.

The essential problem in the second stage of syphilis is not dissimilar to that of the first. The rashes or other evidences of the disease may not be so directly associated with syphilis in the mind of the infected person. His position in relation to the disease may have been somewhat rationalized; he may be calmer. The problem of infectiousness, especially from the mucous membranes, is still acute. He may have spells of "feeling bad all over." Then, after a few months, the disease goes into its latent stage.

The Disease Is Deceptive

Syphilis wears its most deceptive colors in latency. The cocksure patient "knows" he is cured. His rash clears up. If he is like most of his fellows, he lapses from treatment.

Here is a new problem. There are not external evidences. The man is apparently well, save perhaps for a greater susceptibility to fatigue. Only a blood or spinal fluid test will reveal the real condition. Bone injuries may take longer to mend; wounds may be slower to heal.

And latent syphilis is but the prologue to late syphilis. The modern adult is familiar with late syphilis by half a dozen names. "Syphilis" is seldom one of them. To name them will be sufficient to identify their interest to a worker or his employer.

By late syphilis we mean a deadly series of brain and heart complications which the layman seldom knows as "syphilis." Cardiovascular syphilis, which may show itself first in sudden death at time of stress, represents 10 per cent of what the layman knows as heart disease. An internal hemorrhage in some organ which the spirochete has left a mere shell. *Tabes Dorsalis* or locomotor ataxia, which may first begin to evidence itself in minor errors of coordination from a theretofore able worker. Paretic insanity, which may evidence itself in various delusions. Medical literature is full of instances of paretic engineers who ignored signals, of paretic executives who wrecked their companies, and paretic brokers whose depredations against investors were preceded by bursts of salesmanship which their colleagues regarded as genius.

There is no need for alarm over this prospect. There is only need for action. Syphilis can be diagnosed with certainty. It can be treated and cured with greater success than any other serious disease. Even in its late stages it can usually be definitely arrested. The tragedy of this waste of human life and economic resources is that it is absolutely needless.

It is not a simple matter to fight syphilis, but it is effective. It is not inexpensive, but one serious accident or one compensation or damage suit will cost a company much more than an attack on syphilis. Finding syphilis is chiefly a laboratory technic; a test of the blood must supplement the external physical examination. No competent modern physician will tell you he can be consistently certain of his diagnosis of syphilis by a look at the patient.

As evidence of the difficulty of diagnosis, carefully checked records from the country's leading clinics show that 65 per cent of the patients who appear with cardiovascular syphilis don't know they have syphilis. (Their life expectancy at the time of diagnosis for cardiovascular syphilis would be less than four years.)

Half the patients with central nervous system disorders due to syphilis didn't know of their infection. One-third of the patients with syphilis of less than four years' duration didn't know. Syphilis, "the great imitator," if it gave any signs up to that point, had been diagnosed as something much more trivial.

Industry Has Begun the Combat

Industrial surgeons have already tackled syphilis. The medical director in his concern for the basic health of the working force has not overlooked syphilis. Indeed, the current public health program has in some instances only placed popular support behind things that industrial services have been trying earnestly to do.

After the war-time demonstration, industrial interest in syphilis centered in the railroads. The life of a railroad is its reputation for safety. Safety means not only mechanical development, but human alertness, precision, power.

Medical services are an integral part of nearly all railway organizations. Special studies of syphilis among railway employees were carried on after the war by Doctor John H. Stokes, then of the Mayo Clinic, by Doctor O. C. Wenger of the United States Public Health Service, and by several railroad

(*Continued on page 158*)

How Well Is Your Plant Run?

U. L. HARMON
Vice-President
Dryden Rubber Company, Chicago

Three mythical organizations are analyzed from eleven basic angles. Company A is *static*, Company B is *semi-progressive*, Company C is *modern*. How does your own concern stack up?

THE MAIN object of the majority of corporations in existence today is to make a profit in their transactions. To accomplish this purpose, every move or development is carefully studied. First, is it practicable to manufacture? Second, can it be manufactured economically? Third, can it be sold to the consumer?

It is needless to dwell upon the point that every industrial organization is formed with the idea in mind that it has something different to offer the public for which a market can be created, or that it can manufacture an already known product more economically than its competitors and still make a profit. Each has the high ideal that it is going to be exactly as modern as its capital will permit it to be.

Three Typical Companies

I am not going to dwell on the management problem in the formation of new corporations but rather on the managements of theoretically established companies showing what management engineering concerns would include in a survey of three such typical companies.

To use the terms of the management engineers I shall call these concerns *static*, *semi-progessive*, and *modern*, each theoretical company having built its organization according to the management's viewpoint.

In the *static* organization you find:

1. It is not moving forward.
2. It is averse to change.
3. It is out of step with changing methods, equipment, and markets.
4. Costs are high, wages low, profits small and shrinking.

In the *semi-progressive* organization you will find:

1. It is not up to date in many respects, but is making progress in the right direction—although making that progress much more slowly than is necessary or profitable.
2. Performance is better than in the *static* organization, but opportunities for profits in savings and sales are frequently overlooked.
3. Program is not based on studied profit possibilities.
4. Plans are taken off the cuff, so to speak, and are based on insufficient and often on inaccurate information.

In the *modern* organization you will find:

1. It is well organized.
2. It is efficiently operated and profitable.
3. It is guided by facts; it is soundly aggressive.
4. Products, equipment, methods, and ideas are kept up to date by research and analysis.
5. Its conception of management and the means it uses to manage effectively in all departments of activity, are modern and scientific as well as practical and adaptable to changing conditions.

In the following discussion I shall endeavor to point out the differences in the management of these three typical concerns which cause one to be stagnant, another to be slowly moving forward, and the last keeping in step with the times.

Eleven basic policy fields are included in all management surveys. We shall deal with each phase for each of the three companies to show the comparison of one with the other. For convenience, let us call the *static* organization Company A, the *semi-progressive* organization Company B, and the *modern* Company C.

1. Management Organization

STATIC

The management of Company A is of the one-man type. All problems gravitate to the president's desk. His decision only is final. The officers of the company are mere clerks and information bearers who handle nothing but the routine work under their jurisdiction.

What little responsibility is delegated, is done without due authority. The natural result is confusion and dissension throughout the entire organization. Executives and staff alike are constantly "up in the air," and in normal times there is considerable mortality in the more important positions.

SEMI-PROGRESSIVE

We find a rather indefinite understanding in Company B as to the duties of the executives, but the organization is not charted to outline what those duties consist of. It is not arranged on the best functional lines, but there is nowhere any really serious conflict of authority.

Coordination between departments is not good, with friction between Sales and Production, Sales always insisting on conditions that upset efficient factory operation, and winning out. The development training of junior executives is left entirely to chance. When an opening occurs, difficulty arises as to how to fill it.

MODERN

Company C's organization is charted as to functions, personnel, and responsibilities. There is no guesswork. Decisions on departmental problems are made within the department. When problems involve other departments, decisions are made by conference, resulting in excellent inter-departmental coordination. Sales department furnishes production department with orders, giving preferences, then permitting factory to operate on the most efficient basis. Since the organization is charted, key positions are filled by junior executives who have been previously trained.

2. Management Program

STATIC

Company A has no definite plan. It makes no definite effort to insure an adequate return on utilized capital. Because of this lack it is impossible to make a profit forecast. Naturally, with no more information than what is hastily thrown together when a specific need arises, it makes no attempt to budget or forecast actual performances.

Sales effort is unplanned, frequently misdirected. The managing head is content to believe conditions are satisfactory as long as volume holds up.

Prices are undoubtedly based on estimates. No attempt is made to check against actual costs, as no system is set up for this check. When competitive prices are lower than the established estimated prices, the latter are adjusted to meet competition without any conception of net profit effects. If prices are not adjusted, then business is lost, and the basic reason for the loss is never gone into.

SEMI-PROGRESSIVE

This company's management program is somewhat better than that of the *static* organization. Although Company B has a semblance of a plan outlining its efforts, the profit forecast is not based on studied profit possibilities, but rather on a percentage basis used in averaging profit on a limited number of the major items of production.

Company B usually goes far enough to work up a budget, but the structure is rigid. It is based on expense-to-sales ratios according to past performance, not on predetermined flexible standards. The underlying analyses are superficial; they ignore industry conditions or trends, and attainable profit margins.

Prices are based on estimates with some attempt made to check actual cost by spot check on labor charges and material weights. Overhead distribution is often basically unsound.

MODERN

The management program in Company C uses all the tools that are available for properly measuring the ability of the organization. It forecasts profits monthly in conformity to the cyclical requirements. There is budgetary control of all expenditures based on scientifically established standards.

Company C's sales program is consistent with the organization's position in relation to the economic cycle. Selling prices are based on standard costs and correct departmental distribution of overhead, modified by competitive requirements.

At the end of the monthly accounting period this *modern* organization has a complete picture of the immediate past performance; whether the forecast profit was attained; whether sales met the anticipated volume; whether costs were in line—which would bear out the conclusion that the company's selling prices had been properly determined.

3. Financial Policy

STATIC

Here we find no financial policy, except to spend as little as possible. How many times have we heard that "Now is not the time to increase laboratory, research, or engineering expenditures" or "Now is not the time to strengthen the factory or sales organizations."

It may be that now is not the right time to make these expenditures but the question *"Why?"* looms up with almost a shout, and the decisive answer is always "Now is not the time to spend anything, because there is no financial policy on which to base that *now* they *are* ready to do thus and so in the way of expansion in plant, equipment, sales, laboratories, or what have you.

Working capital is inadequate and partially frozen. Balance sheet ratios are "unbalanced." Company credit is nothing for anyone to brag about.

There are either no reserves set up, or only nominal reserves are established without regard to the actual value of the assets. And these reserves are frequently used for other than the original intended purpose. For this reason Company A is never in a position to capitalize on a low market either in materials or equipment. It merely stands still.

SEMI-PROGRESSIVE

Working capital requirements are in better shape in Company B, but they are not accurately predetermined, hence there is no definite provision for economical financing. Depreciation reserves are applied on a lump percentage basis by departments, not taking into consideration the possible length of life of separate equipment, and are conditioned only on allowable deductions for tax purposes. Therefore they incorrectly express the actual remaining value of the assets.

This organization's reserves are not liquid and are frequently misapplied. The financial position of the company is usually fair. Moderate expansion programs are spasmodically planned, but the executives are never sure of themselves.

MODERN

In Company C there is a forecast of required working capital and provision is made in advance for obtaining required funds at economical cost. There are adequate reserves for replacement of obsolescent and depreciating assets, represented by the liquid funds to whatever extent may be required.

Good forecasts of business conditions based on the company's industry position and the general trend of the times supplemented by adequate reserves indicate the right time to go ahead on expansion work or curtail funds for a slowing-up period somewhere in the future.

In this company the dividend policy is consistent with a sound long-term financial program. It is neither a feast nor a famine.

Does your organization stand still? Move slowly forward? Keep step with the times? October *Factory* continues this analysis of management as it is practiced by typical, if mythical, concerns. Here is your chance to find out how good you and your company are

. . . makes you wait until she is good and ready to conclude her chat

Plants Are Like People

JOHN RICHELSEN
Personnel Director
Vanadium Corporation of America, Niagara Falls, N. Y.

INDIVIDUALS have personalities. Communities have personalities. Decidedly do industrial plants have personalities.

To disentangle the causes and conditions that have gone into the bending and determining of a character, whether of an individual or of a group, of a church society or of an industry, is always an interesting study of antecedents and circumstances. However, such academic matters have nothing to do with our particular job. It doesn't do us any good to look at the circumstances that molded us or our plants and say:

"You made me what I am today. I hope you're satisfied."

No Sunday School

But it *does* do good to recognize the character of a given plant and to consider the application of remedial steps, if needed.

An industrial organization is neither a Sunday School nor a reformatory. Our justification for giving earnest attention to the personality of a business unit rests entirely on the fact that dollars and cents are involved. The efficiency of a group of workers in an industrial establishment is affected favorably by the prevailing spirit of energy, loyalty, and good-will, or unfavorably by a characteristic condition of dissatisfaction, bossism, favoritism, and general discontent.

For some reason, there are industrial establishments that treat strangers and workers alike with courtesy and consideration, both in the office and in the plant itself. The girl at the information desk, the watchman at the gate, the purchasing agent and his assistants, the foreman, the junior executive—all seek to serve without unnecessary friction and to transact business without irritating loss of time.

If you become acquainted with the workmen of this same plant, you will find them proud of being with their company. They will brag over a raise of wages that "this plant always leads the way." They take pride in their product and in the success of their company.

Surely we all have had contacts with industrial establishments where the spirit of the plant is precisely the opposite. The watchman is surly and growls when you ask him where to park. The girl at the window makes you wait until she is good and ready to conclude her chat with a typist nearby getting a drink of water. And when she has located the purchasing agent for you, you hear a voice from the inner office, snarling, "What the hell does he want?"

In that sort of plant you find the men saying that they are not going "to take it" any longer than they have to before they get another job. When wages are raised, they will sneer:

"This plant wouldn't do it if they could get out of it."

And as to their jobs, they say they hold them at the whim of their foremen, and they would be "set out on their tails without anybody caring a damn." They gloat over the report that a rival plant beats them to the profitable orders, on the ground that "this outfit's getting what's coming to 'em."

I am willing to swear to the essential truthfulness of the things stated above. But I ask to be excused from offering an extended analysis of the contributing causes for their existence.

Gone Are the Days

If, in any group of men, the squeaking wheel gets the grease, soon all the wheels will join in squeaking in self-defense. If a foreman plays favorites, no worker can rely on him. An efficient plant management insists that the old days of swearing and cursing at employees are gone, and that even under exasperating conditions the difference between a punk foreman and an able one is that between losing temper or keeping poise.

If management tolerates a disposition of carping fault-finding and general nastiness, and allows it to become characteristic of a plant, it will surely reap inefficiency and consequent financial loss.

Standards for Handling Incoming Materials

Necessary preliminary to putting a receiving department on incentive. Sure way to outlaw manual handling

C. H. BRECHIN
Time Study and Methods Department
Westinghouse Electric & Manufacturing Company, Pittsburgh

A COMMON practice in establishing time or piece rate standards to cover the handling of freight both for loading and unloading is to derive a fixed constant per pound or ton for all material handled. This method is usually chosen for two reasons, first because it offers a convenient solution to a problem involving many variables; second because it makes for simplification in the computation of earnings.

Unless a single commodity is being handled in a standardized manner, however, or unless there is a uniform repeat of a variety of commodities in a standardized manner, the plan will be subject to deserving criticism and failure. Applications wherein these ideal conditions are not prevalent and in which incentive practices are desirable, are exceedingly numerous.

Such conditions were found when we commenced an analysis of our Receiving Department to establish an incentive whereby earnings would be directly commensurate with the effort required.

Our former plan comprised one fixed poundage constant covering all freight unloaded, with certain modifications for parcel post and express in terms of an equivalent number of pounds of freight to represent each parcel of post and express received. With several gangs involved, this plan met with dissatisfaction, because the cars involving large bulk and little weight proved unprofitable, and the heavy cars requiring a comparatively short time to unload failed to stimulate the best efforts.

With the jobs properly classified and time values applied in accordance with the effort required, a much better performance has been attained. In addition it has been possible to prorate handling costs to each type of material, thus furthering more accurate costing.

The Receiving Department activity covers receipts by freight cars, express, and parcel post. These, in effect, must be unloaded, thoroughly checked for contents, and loaded on

Formula SK-3 — **TABLE I** — *August 1, 1937*

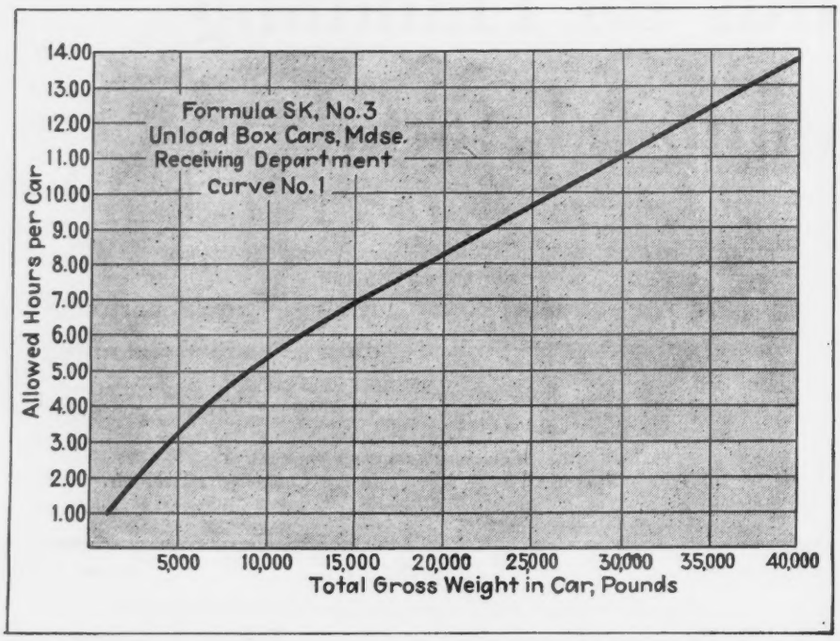
UNLOAD BOX CARLOADS—RECEIVING DEPARTMENT

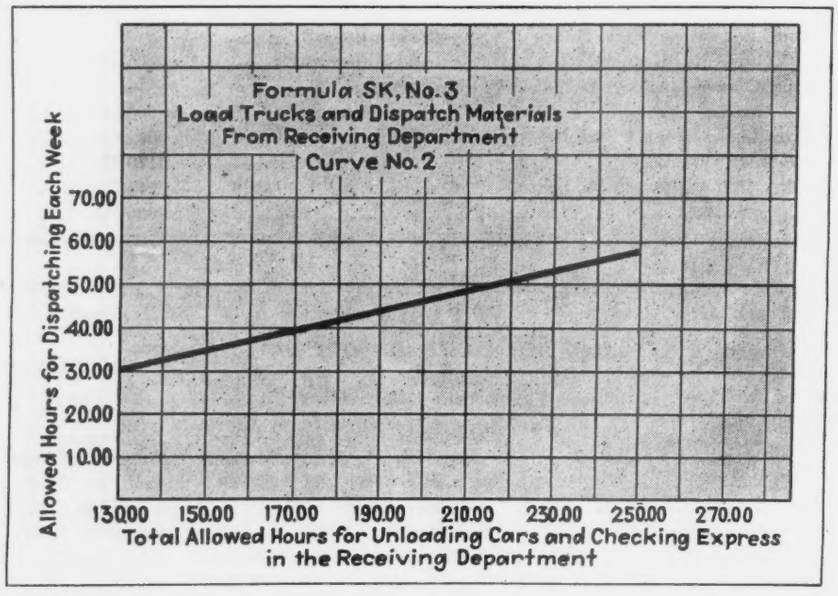
Material Unloaded	*Set-Up Allowance Per Car*	*Allowance Unloading Time*
Reels of Copper Wire, Boxes of Copper, Bundles of Brass and Copper, Bars of Brass and Copper	.50	.0003 Hr./Lb.
Fullerboard, Asbestos Board, Fiber Board in Crates	.50	.00035 Hr./Lb.
Bundles of Steel, Crates of Steel and Slate	.50	.00025 Hr./Lb.
Nails (100-lb. kegs)	.50	.0170 Hr./Keg
Mica (100-lb. to 140-lb. boxes)	.50	.0235 Hr./Box
Paper Towels	.50	.0006 Hr./Lb.

Formula SK-3 — **TABLE II** — *August 1, 1937*

UNLOAD BOX CARLOADS—OUTSIDE SECTIONS

Material Unloaded	*Location*	*Trip Allowance Per Man*	*Set-Up Allowance Per Car*	*Allowance Unloading Time*
24 Reels	#1 S. R.	.25	.50	.0155 Hr./Reel
Welding Wire — Bdls	Warehouse	.10	.80	.00009 Hr./Lb.
Welding Wire — Coils	Warehouse	.10	.80	.00012 Hr./Lb.
Wrapping Paper — Rolls	Warehouse	.10	.90	.0001 Hr./Lb.
Cartons	Warehouse	.10	1.00	.00035 Hr./Lb.
C.R.S. (round & hex.)	#16 S.R.	.15	1.50	.0002 Hr./Lb.
C.R.S. (sq. & rect.)	#16 S.R.	.15	1.50	.00035 Hr./Lb.
Wood Flour	#19 S.R.	.25	.35	.00015 Hr./Lb.
Drums (55-gal.) Varnish	#19 S.R.	.25	1.10	.0615 Hr./Drum
Drums (55-gal.) Varnish	Storage Racks	.25	1.10	.0615 Hr./Drum
Drums (Oil) (ICC-5 type)	#20 S.R.	.25	1.10	.0330 Hr./Drum
Drums (Oil) (barrel type)	#20 S.R.	.25	1.10	.0470 Hr./Drum
Drums — Pitch & Asphalt	#20 S.R.	.25	1.10	.0470 Hr./Drum
Boxes — Varnish & Oil	#20 S.R.	.25	1.10	.0003 Hr./Lb.
Acid Carboys — S.D.Car	#21 S.R.	.25	1.95	.0490 Hr./Carboy
Acid Carboys — D.D.Car	#21 S.R.	.25	3.00	.1000 Hr./Carboy
Boxes of Copper	#21 S.R.	.25	.55	.1100 Hr./Box
Reels of wire	#21 S.R.	.25	1.00	.00026 Hr./Lb.
Excelsior	Storage Tank	.25	.60	.00036 Hr./Lb.
Wood Flour — Silica	#21 S.R.	.25	.85	.00048 Hr./Lb.
Drums — Bakelite or Resin	#21 S.R.	.25	1.10	.1100 Hr./Drum
Conduit Pipe	L-62	.35	.65	.00066 Hr./Lb.





trucks for delivery to the various sections of the works, all duties of which are incorporated in the incentive plan.

Many factors naturally arose in the analysis that called for correction and standardization. In many instances the entire method of unloading was changed in favor of more efficient methods. Conveyors and power trucks were considered for their respective merits and utilized where effective. Hand trucks were permitted only where they proved to be the only suitable method.

On account of the various factors influencing the time required for freight unloading—some of which are bulk, weight, pieces, simple and mixed shipments, and materials easy and difficult to handle—it was found desirable to establish time values in accordance with the materials. This proved quite simple for solid carloads, but presented a problem for carloads of mixed shipments from various suppliers made up at the freight terminals. However, Curve No. 1 was found adequate to cover this divergence.

On all cars studied it was found necessary to keep separate from the handling time those elements common to the car, such as *open car doors, install lighting, remove blocking,* and *clean out car.* These were established as a set-up because they bear little or no relation to the weight involved.

For further modifications it was found desirable to consider measuring sticks other than weight where necessary. Drums within certain sizes, for example, are better handled on a piece basis for there is little or no difference between handling one of 400 lb. and another of 500. Likewise a box of copper weighing 400 lb. can be handled with a crane in the same time as one weighing only 250.

In analyzing parcel post and express checking, several obstacles growing out of improper identification and labeling on the part of a number of suppliers were brought to light. Many suppliers failed to include the purchase order number either in or on the outside of the package. Several omitted the packing list entirely. Others in mailing samples or materials to certain individuals failed to address their packages to the respective parties.

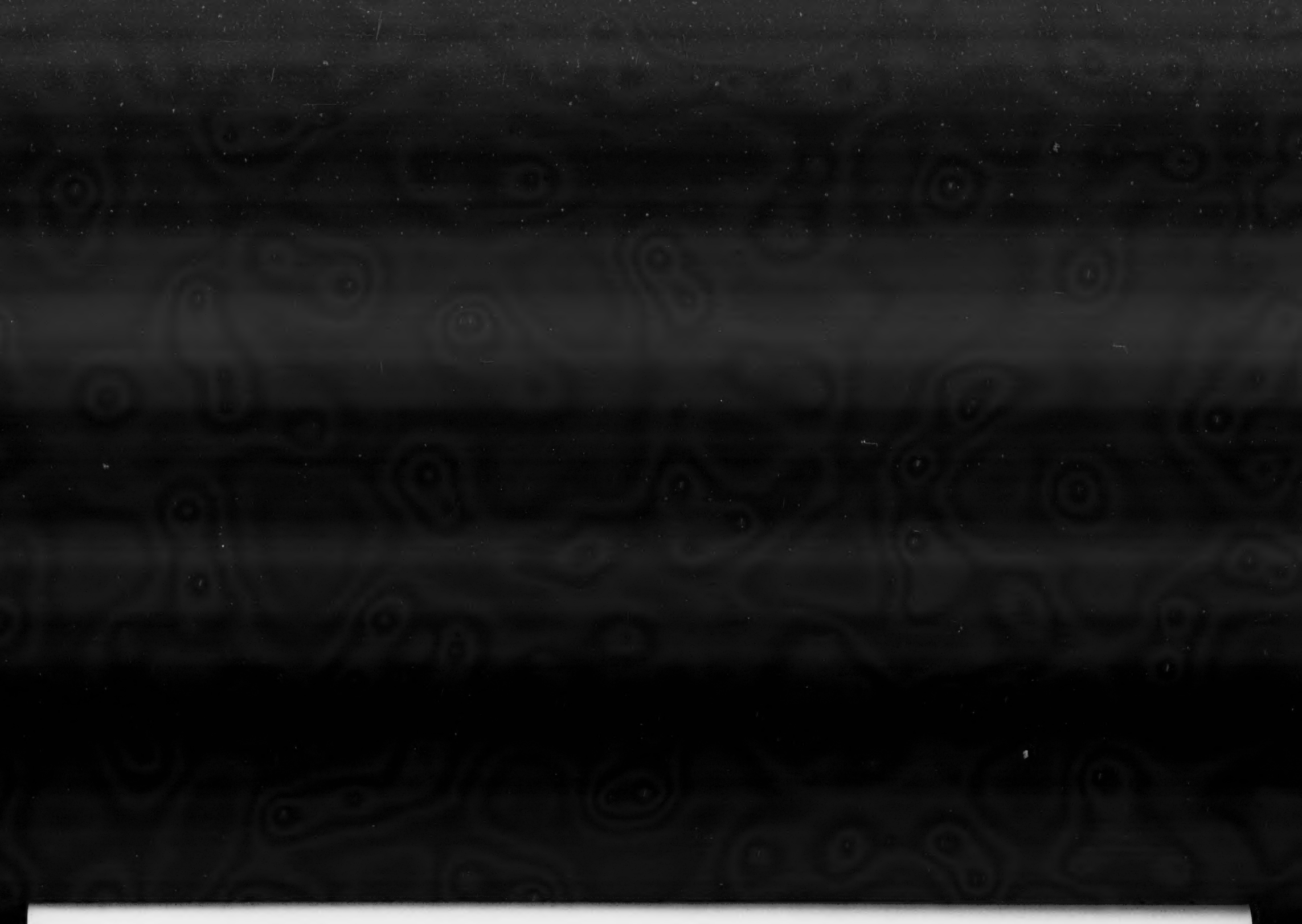
Suppliers Cooperate

All these shortcomings introduced considerable delays and confusion on the part of the checker in disposing of his packages. The Purchasing Department was consulted, with the result that a number of form letters were mailed to the various suppliers acquainting them with the problems imposed by their failure to comply with these matters of routine. Their cooperation was obtained, and most packages now have the purchase order clearly marked on the outside, so that the checker can quickly identify it and pursue an orderly system of checking.

Here again it was found advisable to derive separate values for the various classes of receipts. One time value was found to be sufficient to cover all express receipts, but parcel post values had to be established in line with three classifications—personal packages, purchased material packages, and returned material packages.

It is quite obvious that purchased material packages would necessitate considerably more time compared with the other two because of the time required to check the contents against the purchase orders. The other two are merely recorded by the receiver and sent to the assigned parties for opening and inspection.

(Continued on Page 168)



Factory Orders and Inventory Records

A Case History of Their Mechanical Preparation

KENNETH PORTEOUS
Industrial Engineer
Union Switch & Signal Company, Swissvale, Pa.

TWENTY-NINTH IN THE SERIES OF
FACTORY MANAGEMENT AND MAINTENANCE PLANT OPERATION LIBRARY

1. Factory Orders

OUR FACTORY ORDERS write themselves. It is a common thing to find, in the production of shop orders, that the information contained in the standard route sheets, tool lists, parts lists, and other standard instructions, is copied again and again, first to shop orders, then to time cards and requisitions, then to cost sheets, and so on to who can tell how many other repetitions, every time the equipment is ordered.

Every copying involves not only clerical costs but also delay, and, even more serious, chances for errors in transcription which tend to be cumulative as they are transcribed from form to form.

Seeking a way of reducing this sort of thing in our business, and wanting a plan that would better key into our use of tabulating machines for shop accounting, we investigated many methods. Finally, with the aid of some equipment not in existence when we first started the investigation, we have come close to the ideal of almost completely mechanical, and therefore rapid and virtually error-proof, transcription of the information required by the shop.

Basic Data on Master Cards

All the data as to routing, tooling, material required, and the like, after having once been worked out, are recorded permanently on master cards. Each time an order is to be issued, a temporary master card is written which embodies all the variable information, such as order number and quantity, applicable only to the one order. Combine a temporary master with the proper permanent master and you get a complete requisition, produced wholly by machines.

Even the extensions of unit quantities into totals are taken care of by mechanical, automatic multiplication. Another combination of temporary and permanent masters produces a time card, another the production tracers, and so on for whatever forms may be required.

The master card is a typical punched card for tabulating use except that the information shown by the punched holes is interpreted and written in a single printed line at the top of the card. One or more trips through the machine will combine on one card the basic data on the permanent master and the individual data on the temporary master, producing mechanically a card ready, after use in the shop as a time card, etc., to go through the tabulating machines for accounting, payroll preparation, stock record, posting or other control uses.

Data Automatically Transferred

The data on the original card may be transferred automatically to as many more cards as wished, by a machine that automatically checks the accuracy of its own work.

But a punched card is rather a formidable thing for the uninitiated to read and interpret. Another step was necessary before the system became practicable—an interpretation. Two machines are now available for this purpose. Actuated by the punchings on the face of the card, these machines will interpret the punched data into one or more lines of typed letters and figures, giving in clearly legible typewritten words and figures, the description, dimensions, part number, and so on for a requisition, or the operations, rates, and other details required for a time card.

The flexibility provided by these machines made it possible for us to tie our accounting and shop systems into a single unit. It has eliminated the pyramided transcriptions (including the transcription from the shop record to the tabulating machine card). It has speeded up the whole process and made it more accurate.

Material charges, the calculation and accumulation of earnings for payroll, the preparation of pay checks and related records, provision for Social Security requirements, and, as a byproduct, the preparation of inventory tickets and the automatic pricing and calculation of inventory values, are provided for.

Let's summarize the mechanical processes, starting with the printing punch. It works like a typewriter. Reading from the bills of material sent us by the Engineering Department, the operator writes the necessary information in condensed form on the card. It appears as a series of punched holes spaced horizontally and vertically in the familiar digit code. Simultaneously, it appears as a typewritten line on the card face.

Put this master into a reproducing punch. It will duplicate all or any part of the punching exactly, on as many cards as may be required. Put the reproduced cards into a numerical interpreter and it will transcribe the information as a typical line on the card. Or put both masters and reproduced cards into an alphabetic printer and it will read and decode the holes in the masters, either letters or numerals, and print the interpretation on the reproduced card.

There is complete flexibility in the utilization of punching or printing to satisfy all requirements, and an opportunity to combine them in such a way as to increase the normal information-holding capacity of the standard tabulating card. Figure 1 shows these mechanical processes.

Bear in mind that all these processes are performed in bulk. After the masters are pulled from the files, they are assembled in like piles (requisitions, time cards, etc.), and fed through the machines in stacks, with the corresponding blank card forms.

The reproduced cards can be sorted mechanically by order number, department number, or any other sequence, in the sorting machine which is a standard part of tabulating installations. The masters may be sorted to assembly part number to re-combine the various types of cards into groups in preparation for filing.

Cheaper to Make Extra Forms

The machines operate automatically at speeds varying from 75 cards a minute for the interpreting machine to 400 cards a minute for the sorter. The cards cost little, and the whole process is relatively so inexpensive, where any volume of clerical work is to be done, that it is cheaper to produce a few extra forms in the beginning (to accomplish the uniformity required for mechanical reproduction) and throw away those not needed, than to have to write by long hand those that are needed later.

Types of cost control whose desirability is recognized, but which have been dodged because of their cost with manual clerical methods, become practicable with the compact, mechanical production and handling of data this set-up gives.

We are manufacturers of railway signaling appliances and systems. Our product is both mechanical and

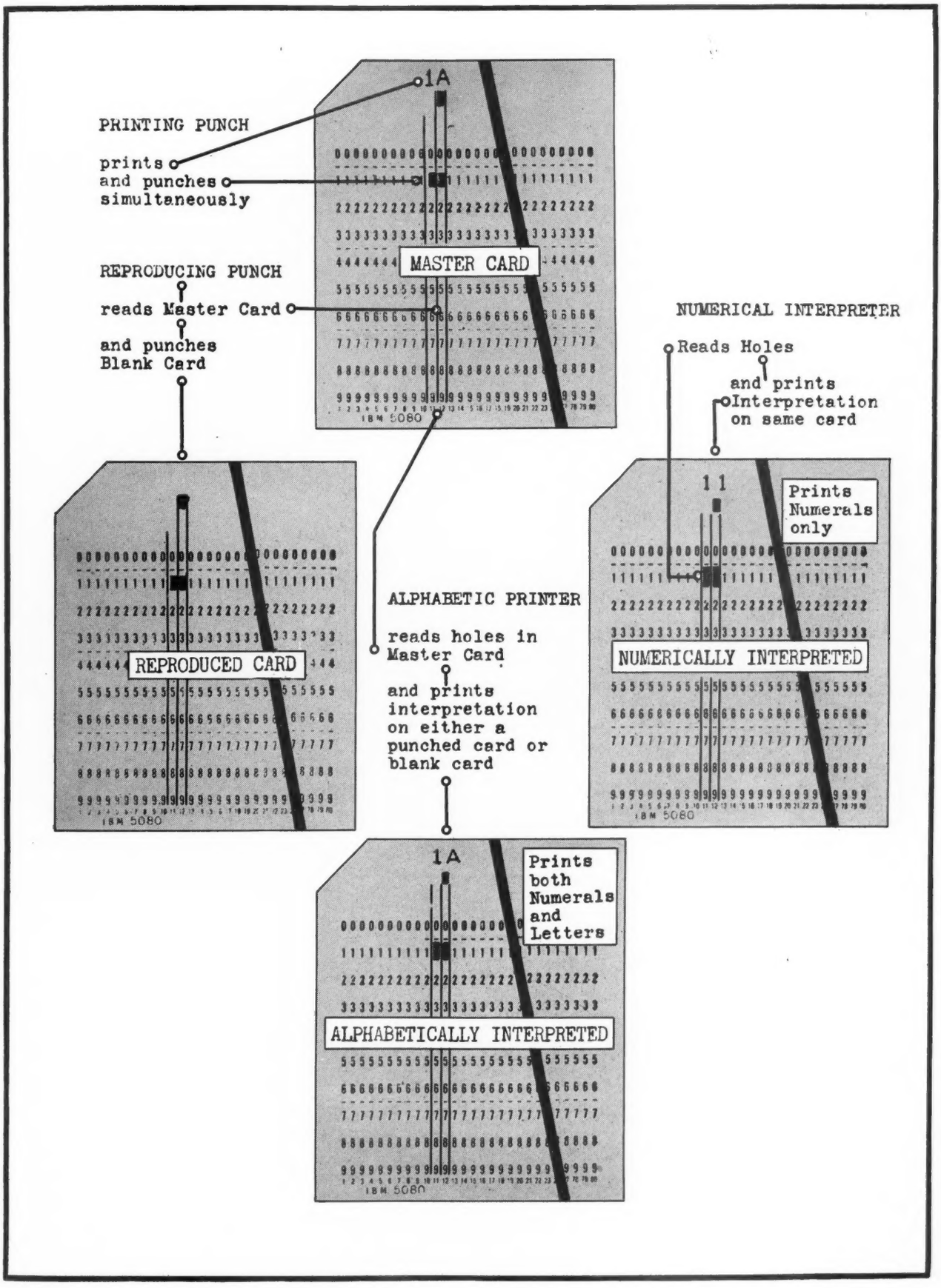


Figure 1. Printing punch, reproducing punch, numerical interpreter, and alphabetic printer give this system complete punching and printing flexibility

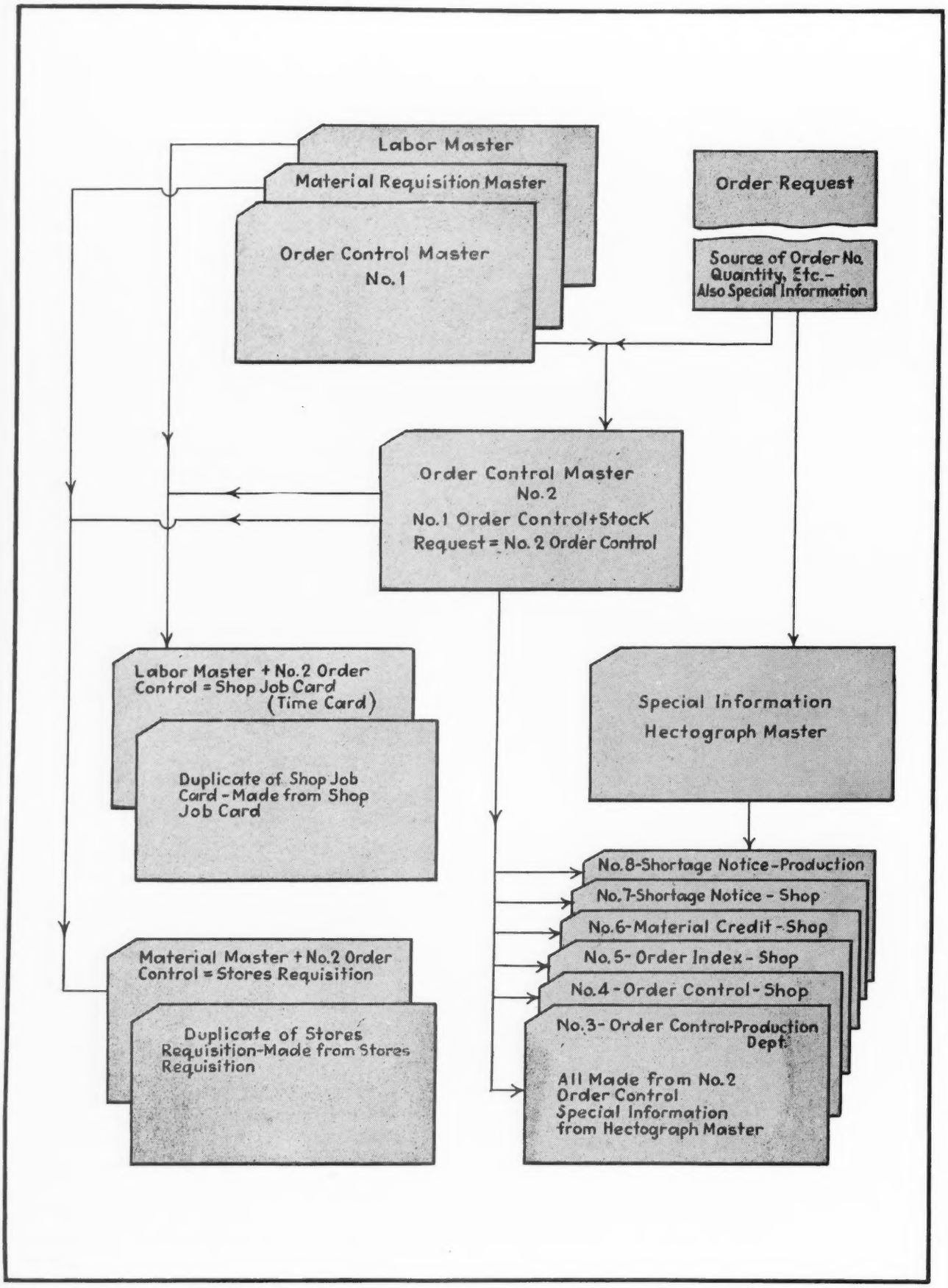
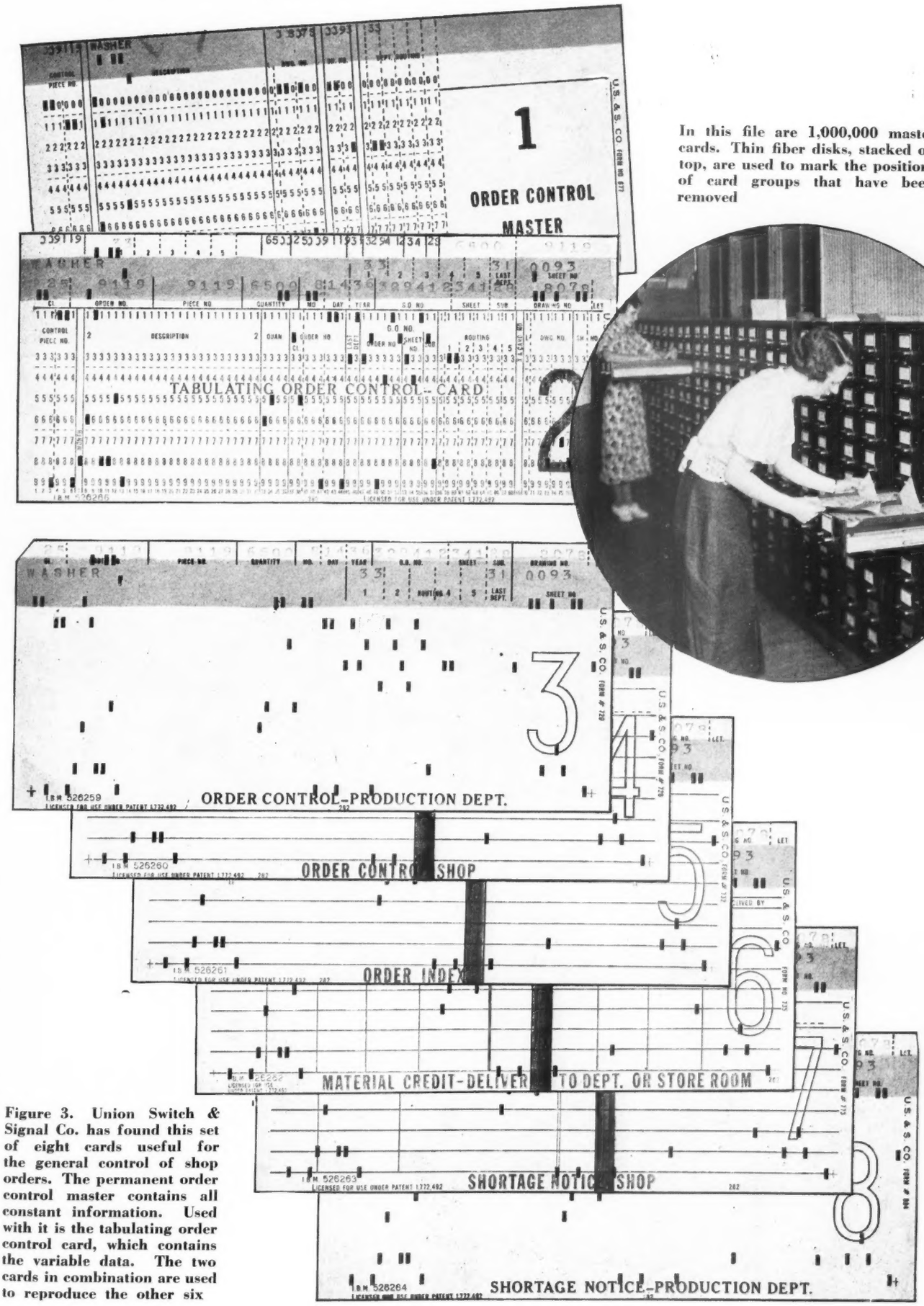


Figure 2. This simple flow chart shows how all necessary copies of shop orders are reproduced from master cards combined with a card that contains variable information



In this file are 1,000,000 master cards. Thin fiber disks, stacked on top, are used to mark the positions of card groups that have been removed

Figure 3. Union Switch & Signal Co. has found this set of eight cards useful for the general control of shop orders. The permanent order control master contains all constant information. Used with it is the tabulating order control card, which contains the variable data. The two cards in combination are used to reproduce the other six

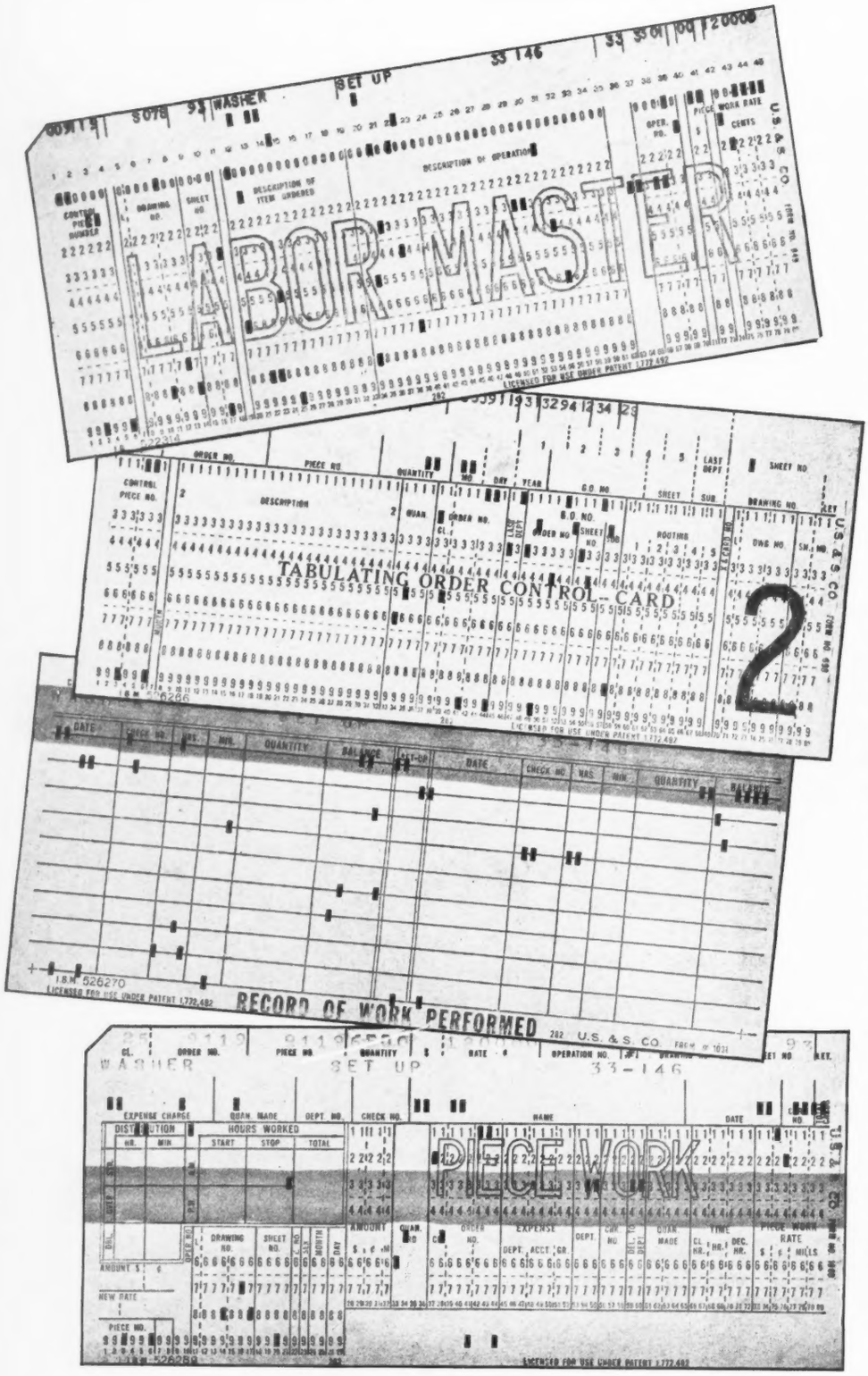


Figure 4. The time card is a composite of the order control card and the permanent labor master, which is drawn from the file. Two copies of each job are prepared. One serves as authorization and instruction card; the other is held by the shop clerk for scheduling purposes

electrical, and ranges from clockwork movements to heavy equipment for directing and retarding the movements of railway cars, from simple electrical resistance units to complete traffic control systems of the most intricate design. Altogether, we carry more than 60,000 stores items, issue some 400 shop orders daily, and prepare about 12,000 cards constituting requisitions and other forms.

In spite of this, for all order requisitions reaching the tabulating division before noon, the shop orders are completed that day. Two-hour service is given on the more urgent orders. The backlog of unwritten orders, taken for granted before the new system was put into effect, no longer exists.

Preparation of an Order

A better idea of the present system, employing the tabulating equipment, may be had by following through the preparation of an order for a simple part such as a fiber washer. See Figure 2.

Except in the case of a change in design or methods, such an order would originate as a requisition for the replenishment of stores. Since the part has been produced before, master cards will be in the files. The order originates in the Shop Order Division where a file is maintained of master operation sheets for processed parts and assembly lists for assembled items. The master operation sheet is pulled from the file, an order request is attached, and both sheets are transmitted to the Tabulating Division, where the corresponding group of master cards is withdrawn from the file.

This group is made up of three types of master cards:

1. A card that describes the item to be made. It bears a part number, key description, drawing references, and shop routing.

2. A master requisition for the stores material. It contains the number of the part in which used, its individual part or commodity number, unit quantity, description, drawing references, and storeroom location.

3. One master job card for each shop operation or machine set-up in each department through which the job is routed. It is punched for part number, a key description of the item to be made, description of the operation, drawing references, operation number and piecework rate, or set-up allowance and tool number.

If the part ordered is an assembled item, exactly the same cards will

be found in the file, except that the single requisition master will be expanded into one card for each component of the assembly.

These three types of master cards contain all the fixed data used for ordering. A fourth card, which contains the variable information such as quantity ordered, order number, shipping order number, and final delivery point, is the only one needed for the individual order that is not contained in the master file.

One such card is made for each item ordered. It is prepared in the printing punch and carefully checked before use. Since this is the only manually prepared card for an entire order, and the one that governs the amount of material requisitioned, most of our effort is concentrated on it. We know that the master cards, checked for accuracy at the time of their initial use, are correct, except for the substitution of part numbers or other minor changes which are picked up when ordering by comparing the master requisitions with the operation sheet or assembly list.

Controlling the Order

For our particular business, we have found the following set of forms useful for the general control of the order:

1. The permanent order control master already described.

2. A tabulating order control card used by the tabulating division as a master card to transfer variable data to all other cards when ordering. This card is a composite of standard data mechanically transcribed from the order control master (1), and of the order information, manually transcribed from the order request. The other cards in this series are exact duplicates of this card, except for the differences in the printing of the form to indicate its use.

3. A notification to the production department that the order has been issued. This copy is retained in the production department file until the shop reports that the order has been completed.

4. An extra copy for miscellaneous use.

5. A copy filed by the foreman's clerk as an index to the orders in his department. Enough of these copies are issued to supply each department concerned. This copy clears to a dead file when the order is shipped.

6. A material credit, used as an acknowledgment of interdepartmental shipment. This credit is retained by the shop until all labor has been cleared, when it is transferred to a

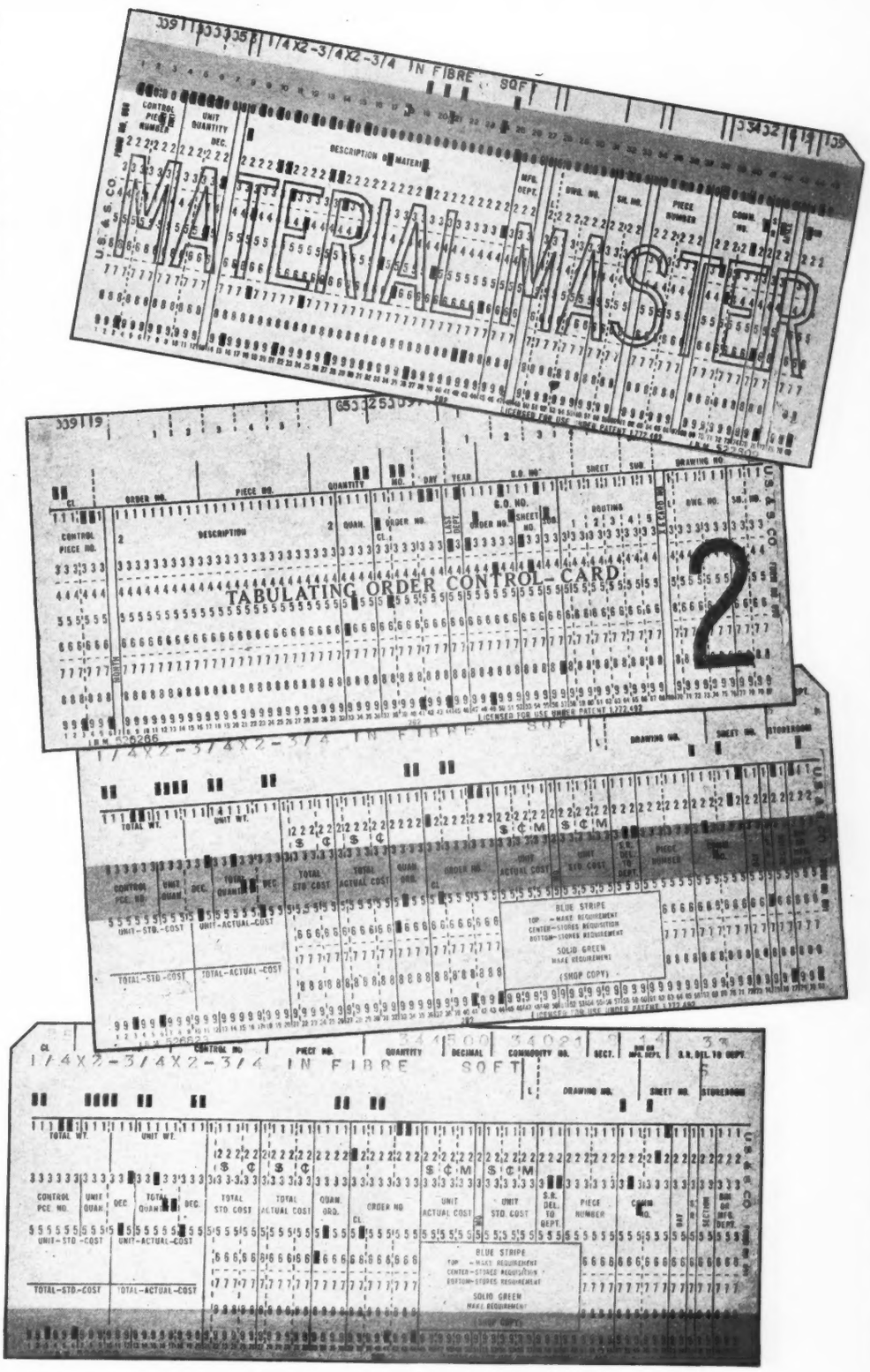


Figure 5. Material requisitions are written in much the same way as the time cards (see Figure 4), by the combination of the order master and a material master. Two copies of this particular form are made. One is for the storeroom, while the other serves as a material requirement card

dead file unless actual costs are to be worked up. In this case the card will be called for by the Accounting Department.

7 and 8. Two more cards may be required. If further demands on the stock of the item carry it below the ordering point to an emergency point, the shop must be notified to give preference to the order already placed, which otherwise could take its turn. When this happens a shortage notice (7) and a copy of this notice (8) for the production department are run off from the tabulating order control card (2).

The shortage notice (7) is transmitted to the production department by the shop when the order is completed; its use in the department varies. The copy (8) is used by the production department as a progress record and follow-up, as each operation is completed. Progress records are not ordinarily required for stock orders on which a shortage does not exist.

In addition to this set of forms (see Figure 3) for the general control of the order, with extra copies in case more than one department is to work on the order, time cards, material requisitions, and occasionally other forms such as credits for material will be required. Of these, the production of the two most important types, the time card and the requisition, will be described.

Time Card a Composite

The time or job card is a composite of the order control card (2) and the permanent labor master (see Figure 4, also Figure 2) which is drawn from the file. Two copies of each job are prepared. The first of these serves as an authorization and instruction card and is turned in by the workman at the completion of the job with a record of quantity made and time worked. This is not the time worked on the individual job, but the starting and stopping time and hours worked for the day.

The duplicate is held by the shop clerk for scheduling purposes and as a record of uncompleted operations in the department. It is transferred to a dead file when the original is turned in completed. Partial completion of the order is recorded on the duplicate card.

To create time cards for shop use, the order masters and the labor masters are sorted together mechanically, which places the order master card (2) ahead of each group of labor cards bearing the same part number. They are then placed in the reproducing punch, and the information on both cards is transferred to the blank. The duplicate card is made from the card first reproduced.

Both cards are interpreted in the numerical interpreter, which prints the top line of the card. Both master cards and reproduced cards are then run through the alphabetic printer which reads from the master card and prints the second line on the reproduced card. Only that part of the information punched in the master card that is of later use in the tabulating machines (which recognize holes only) is reproduced as holes in the cards made for shop use. The balance of the information is transferred as printing only.

Material Requisitions

Material requisitions are written in much the same way, by the combination of the order master (2) and of a material master. See Figure 5, also Figure 2. Two copies are prepared of each requisition. One copy is for the storeroom. If not a stock item, it serves as a memorandum card for the department using the material and notifies them where to obtain it. The other copy serves as a material requirement card and is used in apportioning the item immediately the order is issued for stock components, giving the earliest possible opportunity to re-order components which may be operated with low minimums.

One additional step is involved in the production of requisitions that does not apply to any other card—the calculation of total quantity. The unit quantity comes from the requisition master, the order quantity from the order master (2). These two factors are extended in the multiplying punch, which punches the total quantity in the card.

All quantities must be expressed as whole numbers or decimals. The multiplying punch cannot handle fractions. Following the calculation of total quantity, the duplicate requirement card is made from the requisition to avoid making two extensions for each requisition.

Cards are also made for items not stock, for the reason that, after posting the stock record, all cards are re-assembled in order sequence for use by the production department and are filed for reference until the order is completed. Assembly lists may not always answer for reference because of substitutions, etc. As mentioned above, the original card for an item not stocked serves as a memorandum in the shop of those items which are to be furnished direct by other departments.

Color stripes, clipped corners, etc., as well as variations in the printing of the forms themselves, are used to aid in distinguishing the various card forms.

The apportionment cards are cleared as soon as the order is received, to insure against shortages. The other cards are released to the shop twice each day.

These forms and records were worked out to meet conditions existing in our plant at the time of installation. The groundwork has been laid for scheduling, budgeting, or other activities as changing business and plant conditions demand.

An incidental advantage of the plan is the uniformity of size of all shop forms, thus simplifying and condensing the files, and providing great flexibility in the use of the records. We have also found that the plan gives unusual capacity for peak loads. The regular card-writing group can be supplemented by taking people from the sorting and tabulating machines to meet any temporary overload. This capacity was notably demonstrated in the unusual rush of orders resulting from the flood of 1936 in the Pittsburgh district.

Same Forms for Special Orders

The same card forms are used for certain special orders for which no masters exist and for which they are not usable. This is accomplished by typing the order on a sheet form the size of a tabulating card, using hectograph carbon.

From this master copy the other forms are duplicated, using the direct process which produces copies direct from the master without the intervention of a gelatin medium. This method is particularly well suited for use with tabulating cards because it is rapid, does not warp the card, and because, with the alcohol solution used instead of water, the cards dry so quickly that they can be run through tabulating machines without waiting.

This same machine is used to duplicate special notes on machine-made cards when there is a variation from the standard product. Painting specifications and coil-winding specifications vary constantly, for instance, while other features may remain standard for a long time.

2. Inventory Records

THE STEPS involved in taking a periodical physical inventory of stores materials may be roughly classified as follows:

1. Preparation of inventory tags describing the material.

2. Counting, weighing, measuring, or estimating the quantity on hand, and recording the quantity on inventory tags.

3. Accounting for all tags.

4. Posting the inventory to stock records.

5. Calculation of value of each lot of material.

6. Analyses of inventory values by various classification groupings.

7. Calculation of total value of all material.

It is customary to find the inventory tags written by hand, priced manually from cost records, the value of individual tags computed with manually operated calculating machines, and the total values computed by the same means. If accounting tabulating machines are available, it is the usual practice to transfer identification codes and values to tabulating cards and to arrive at total values by adding the cards in automatic accounting tabulators.

It is a formidable task to accomplish the foregoing as an addition to the regular work of the various departments involved and usually within a definitely limited period.

Many Chances for Errors

It may even be quite a costly procedure where stores items are numbered in the tens of thousands. Difficulties of reconciling the inventory are usually aggravated by missing items, lack of uniformity in describing material, and transcription errors, which are sure to creep in when the writing of tags is done by individuals not usually concerned with stores control. Sorting tags by hand is a slow process.

Mechanization of the writing of inventory tags, pricing, calculation of values, and sorting to the required classifications, not only obviates many of the difficulties, but also results in a more accurate inventory, conducted with minimum interference to normal functions.

Not much can be done to mechanize the inventory of work in progress, until the point of calculating values has been reached. The work-in-progress inventory can be made to key into the stores inventory at this point.

The first requirement in the design of a mechanical method is the establishment of a master file of material descriptions and costs. An ideal medium on which to record these data for automatic reproduction is a tabulating card, because of the ease with which it can be prepared, the compactness of the file, and the way in which it lends itself to the mechanization of subsequent moves. Figure 6 shows a simple flow chart of the mechanical method we use in the preparation of inventory forms. Figure 7 is the old superseded handwritten tag.

Figure 8 illustrates a set of our inventory cards. The one at the top with no number is a typical master card. Observe that in addition to descriptive and cost data, it records storeroom location.

The master file may be kept up currently throughout the year or, just prior to the preparation of inventory cards, the master cards may be listed in an accounting tabulator for checking in the Stores and Accounting Departments.

The other forms used by the Stores and Accounting Departments are likewise shown in Figure 8. *Number 1* is the stores card on which the quantity of material is recorded. *Number 2* is the cost card from which values are calculated.

There are several reasons why it is convenient to establish separate cards for the two purposes:

1. Some of the stores cards will be returned in bad condition.

2. There will likely be changes in the cost or price of a number of items during the lapse of time between the preparation of the inventory cards and the close of the inventory period.

3. The separate set of cost cards

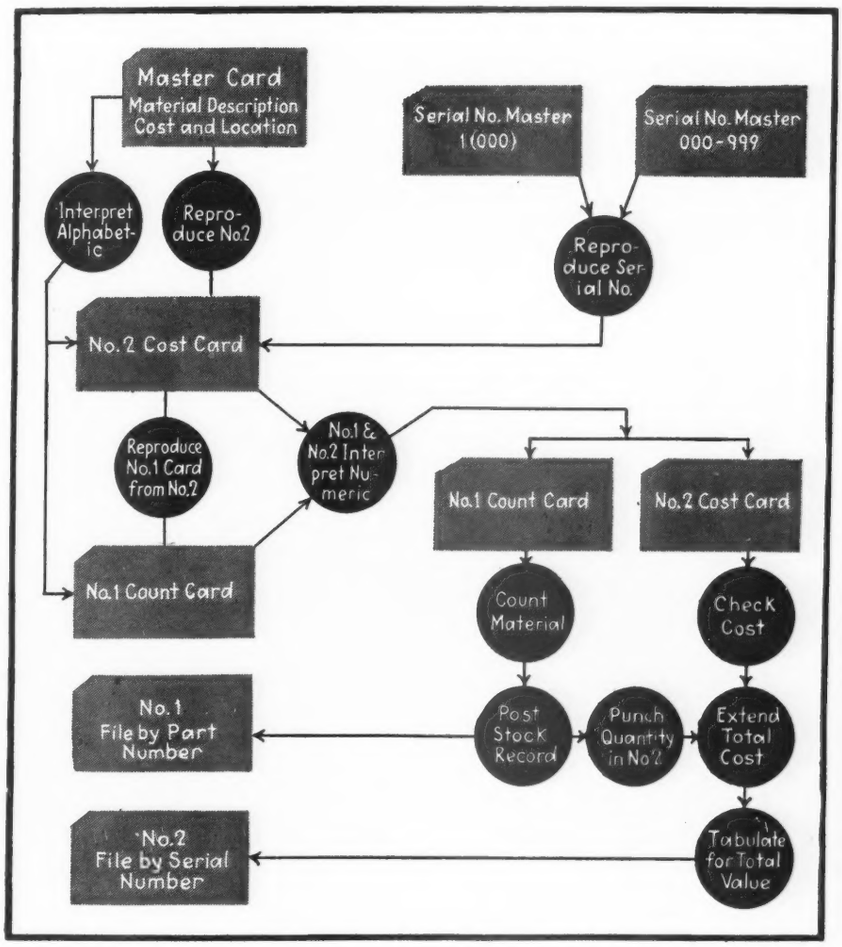


Figure 6. The same equipment used for the mechanical preparation of shop orders is utilized for the reproduction of inventory records

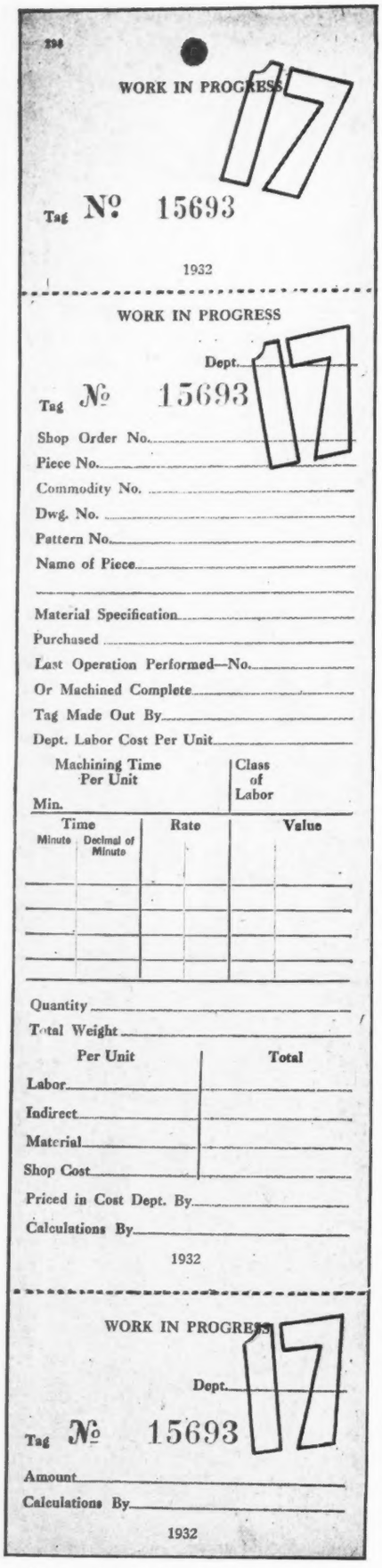


Figure 7. This is the old inventory card that has been superseded

remains in the hands of the Accounting Department, and since both the cost cards and stores cards are serially numbered alike and both record the location of the material described thereon, there is no possibility of the loss of a stores card. Should a stores card be temporarily lost, it is always possible to go directly to the bin location in which it should be found.

4. The two sets of cards permit the posting of the quantity to the stock record (where the stock record is centralized) and the calculation of values to proceed simultaneously.

Number 3 is a work-in-progress inventory card. It is prepared manually in the same way that the familiar inventory tag is usually made. After the stub has been removed, the form becomes a standard tabulating card so that the value of the material recorded on the individual cards may be mechanically added.

Number 4 is the card provided for calculating the labor, burden, and material components of the cost. When used, it is mechanically reproduced, in part; from the cost card (2), it is mechanically extended and added.

Making Stores and Cost Cards

Assuming the master file to be ready for use, the procedure of creating the stores card (1) and cost card (2) is as follows:

The numerical data relating to part or pattern number, drawing references, storeroom location, cost, etc., are reproduced from the master card to the No. 2 cost card. This is done by placing the master cards in one feed hopper of a high-speed reproducing punch and the blank No. 2 cards in the other feed hopper. As the cards feed through the machine, the holes in the master card representing the needed data, are automatically duplicated in the No. 2 card.

Both sets of cards are then put through an accounting machine equipped to read the holes in the master card which represent the alphabetic description, and to print an interpretation of the holes on the No. 2 card. The description of material then appears as a printed line on the No. 2 card even though the card contains no corresponding holes. This artifice is used to increase the capacity of the No. 2 card.

The master cards are then laid aside for later use in printing the material description to the No. 1 stores cards.

A second set of master cards is introduced at this time as the source of the card serial number. This set consists of 1,000 cards pre-punched progressively from 000 to 999. Supplementary cards are provided for each thousand unit—1(000), 2(000), etc. The set punched 000 to 999 is used over and over as the source of the last three digits of the serial number, together with one card for the fourth (or higher) digit.

The cards punched 000 to 999 are placed in one hopper of the reproducing punch and 1,000 No. 2 cards (preceded by the fourth digit card) in the other feed hopper. Thus the No. 2 card is serially numbered.

After the serial number has been applied to the No. 2 cost card, it in turn becomes a master used in creating the No. 1 stores card, which is made as an exact duplicate of the No. 2 card except that the unit cost is omitted.

The material description is then printed on the stores card, using the master cards in the manner already described.

At this point both the No. 1 and No. 2 cards are fed through a numerical interpreting machine which omits the first line at the top of the card. On this line are numerical data punched in the card (as distinguished from the second line which is read from the master.

Because the fields representing *total quantity* (T. Q.), *unit cost* (U. C.), and *total amount* (T. A.) are not punched in the stores card, the corresponding spaces on the stores card allotted to receipts and disbursements contain no holes to interfere with writing in the *received, issues,* and *balance* columns. Although it is feasible to write between the lines of intermittently punched holes, it is better practice to provide unpunched space for use in writing in important data. The same remarks apply to the *quantity, weight,* and *cost* columns of the cost card.

Both the No. 2 set and the No. 1 set are next passed through a numerical interpreting machine which prints at the top of the card an interpretation of the holes representing part numbers, drawing references, serial numbers, etc. Both sets of cards are now ready for use. They have been pre-punched for later machine use and have been made readable without reference to the punched holes.

The cost cards are checked for correct unit cost by the Accounting Division, and any incorrect cards are replaced.

The stores cards (in storeroom location sequence) are forwarded to

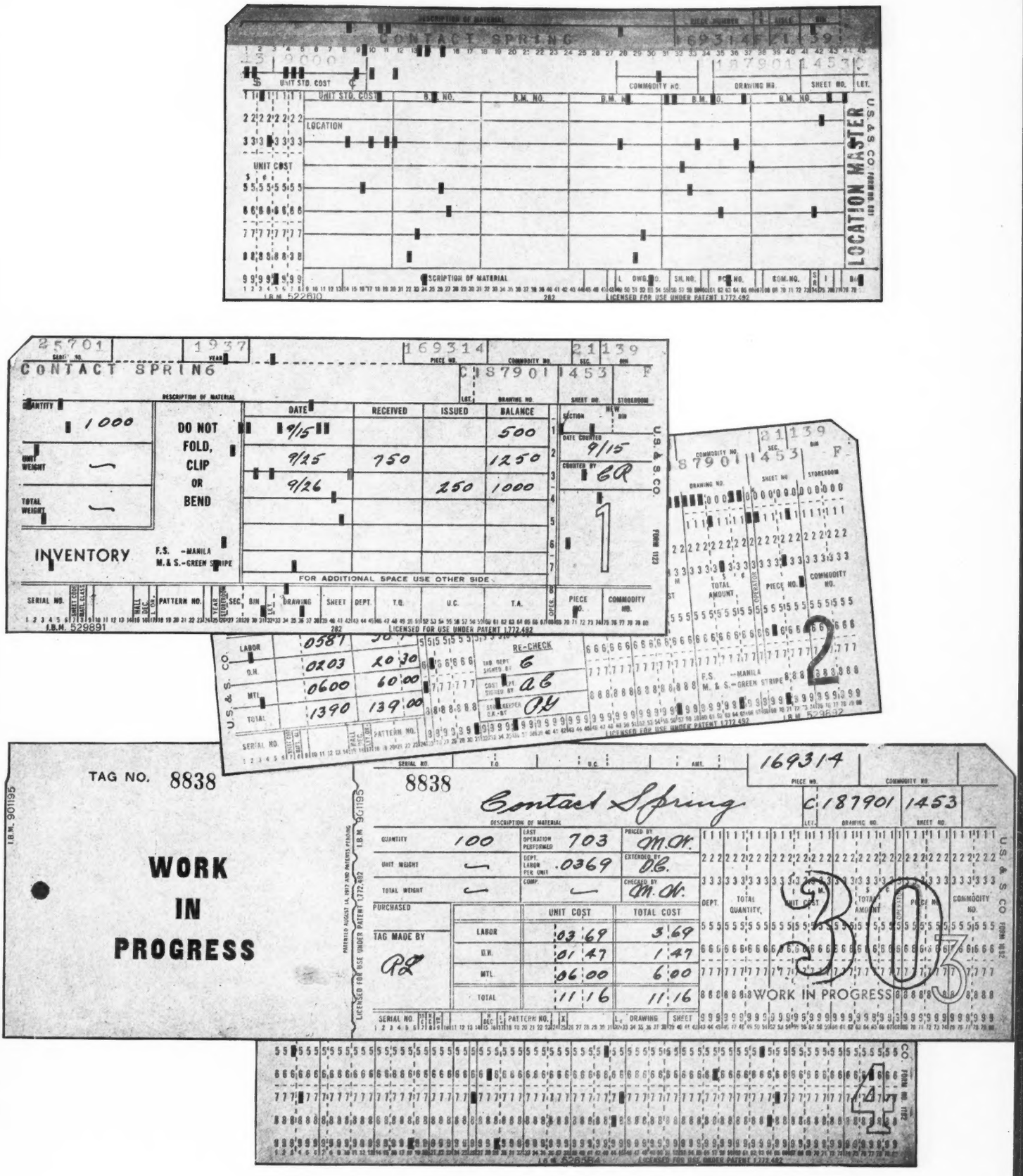


Figure 8. A set of inventory cards used by Union Switch & Signal Co. The one at the top with no number is a typical master card which records storeroom location

INVENTORY

TAG NO.	PIECE OR PATT. NO.	QUANTITY	UNIT COST	AMOUNT
1001	159876	25	100000	25000
1002	153286	2	59168	1183
1003	178476	500	176	880
1004	116769	1000	52	520
				27583*

INVENTORY — UNIT COSTS

TAG NO.	DIRECT LABOR	IND. COST	MATERIAL	TOTAL

Figure 9. The cost cards are listed for permanent record on inventory sheets like these

View of department where d.c. relays are made

the storeroom to be used in recording the quantity of material.

After the quantity of material has been ascertained and recorded on the stores cards, they are returned to the Tabulating Division where they are mechanically sorted to serial number sequence. Since each storeroom's cards are numbered consecutively, it is an easy matter to spot missing cards.

The cards are then sorted to part number or pattern number sequence for posting to the centralized stock record. After posting they are returned to the Tabulating Division where each stores card is matched with the corresponding cost card. The quantity is read from the stores card and manually punched to the cost card as part of the matching operation.

The cost cards are then put through an automatic multiplying punch which performs the calculation of "quantity times unit cost" and punches the "total cost" in the proper field of the card.

The cost cards are then ready for use in the automatic accounting machines where total inventory values are accumulated, or for sorting to various classifications for detailed analyses.

The cost cards are listed for permanent record on sheets suitable for binding (Figure 9), and filed for reference in serial number sequence. The stores cards are filed for reference in part number sequence.

If labor, burden, and material are to be separately calculated, the cost cards are used as masters from which to reproduce the needed identification numbers, quantity, and total cost to the No. 4 card, which after pricing and punching, may be extended in the multiplying punch, as above, except that the cards must pass through the machine once for each extension—total labor, total burden, and total material cost. A cross footing of these three factors must of course equal the total cost transferred from the original No. 2 cost card.

Centralization of most of the preparatory work and subsequent calculations results in an accurate inventory, promptly disposed of, with a minimum of disturbance to normal routine. When the machines needed are used in daily order writing, accounting, or payroll work, the labor and form costs in connection with the physical inventory are materially reduced.

When Wiring Your Plant

Each of the different types of insulation used on wires and cables has features that often make its use particularly advantageous

F. L. AIME
Electrical Engineer
Anaconda Wire & Cable Company
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LAST MONTH some of the general characteristics and applications of the types of insulation used on wires and cables were discussed briefly. In this article characteristics that influence the choice for different voltages and conditions will be considered.

For 601- to 7,500-volt operation, rubber, varnished-cambric, and paper-insulated cables are all used, but greater discrimination is necessary in the selection of the proper insulation.

Rubber-insulated cables are used for a wide range of applications up to 5,000 volts, especially with small- and moderate-sized conductors. In this voltage range the special rubber compounds become more justified because of the advantages they offer, the relatively greater importance of reliability of the circuit, and the over-all economy in their use, despite their somewhat higher cost.

Varnished cambric-insulated cables are, however, more widely used in this voltage range for the reasons given previously in the discussion of 0/600-volt operation, and for these additional reasons which are oftentimes of considerable importance:

1. They can be used in dry locations with a braid covering instead of lead sheath, thus saving in weight, cost, and cable diameter.

2. Cables with varnished cambric insulation are used in places where space or convenience does not permit the use of potheads. For indoor use where cables are free of moisture, the ends can be terminated by taping.

Paper-insulated cables also are widely used in this voltage range for the same reasons enumerated under 600-volt operation. In addition, insulation thickness is a minimum, thus saving in weight and cable diameter. Where space is a factor, and hence the diameter of a cable is important, the smallest permissible conductor size can be obtained with paper insulation, because insulation thickness is smaller by comparison. Sector-shape conductors can be used in multi-conductor cables and will further reduce the cable diameter. Paper-lead cables, however, require potheads for voltages above 600. Below 600 volts, potheads can be omitted.

Rubber for Motor Leads

For power circuits operating at 7,501-15,000 volts and above, rubber, varnished-cambric, and paper-insulated cables are all used. Selection should be made only after careful consideration of the various conditions under which the cable must operate, such as temperature, installation conditions, and so on. Paper-insulated cables are excellent for this voltage range because for such circuits, usually main feeders, the combination of advantages offered is most suitable.

Among them are: (1) Highest reliability and longest life; (2) highest permissible conductor temperature, hence smallest permissible conductor size and maximum conductor efficiency; (3) sector-shape conductors can be used in multiple-conductor cables; (4) minimum insulation thickness by comparison with other insulations: (5) where cable diameter is important, as when installed in ducts, a minimum over-all cable diameter can be obtained; (6) paper insulation affords the greatest uniformity and highest unit dielectric strength.

Under ordinary conditions (0-600 volts) rubber-insulated cables are generally selected for motor and apparatus leads. For conductor temperatures above 60 deg. C., and more severe operating conditions, it is good practice to use special compounds or varnished-cambric insulation, the latter especially for 500,000-circ. mil conductors or larger. The flexibility of varnished-cambric cables also offers a distinct advantage when these are used as motor and apparatus leads.

Above 600 volts the use of special rubber compounds or varnished cambric insulation is good practice, the choice between the two depending on various factors. Varnished-cambric cables have an advantage in the higher-voltage range because they can be terminated without potheads.

On portable and extension-cable circuits many advantages are obtained by the use of rubber-jacketed cables for such applications as air compressors, drills, shovels, tunnel and subway power and lighting, and welding tools.

The usual construction involves use of flexible conductors, some of the better grades of rubber compound insulation and a special rubber or synthetic jacket, plain or with a variety of outer coverings. Portable cables can be obtained for any ordinary usage, and most all severe services, including resistance to oil, gasoline, solvents, abrasion, impact, tension, heat, and moisture.

Control cables are selected in a manner similar to power cables, so far as exposure is concerned. Rubber insulation is the most advantageous and is almost always used, inasmuch as the voltage usually is low and good flexibility is desired as well as effective protection against moisture. Since the conductor carries little current except momentarily, heat dissipation is a minor factor.

Several standard insulating compounds are used on such cables, and are entirely satisfactory. They should be of higher grade than Code or Intermediate rubber. Occasionally special compounds are justified for unusual conditions.

By the use of six different-colored yarns in braiding, a standard method of identifying conductors by means of these braids has been worked out by the industry, and generally accepted for 37 different combinations. We have extended this series of combinations to 81, so that each con-

ductor of an 81-conductor control cable has its own color combination.

No one knows better than the man on the job what conditions the cable will have to meet. Since every factory has its own peculiar problems, and usually a peculiar combination of conditions that must be met, the first step in selecting the proper wire and cable is to find out what these conditions are in the plant as a whole, as well as in each section or process, and the requirements for successful operation.

Besides heat, most cables are subjected to other kinds of deteriorating influences called "exposures" for convenience. These include acids and alkalis; continuous submersion; solvents, such as gasoline, benzol, and the like; corrosive vapors; mineral oils; possible momentary flame, or adjacent arcs; external heat; abrasion; impact; vibration; extreme tension in service; electrolysis; corrosion; internal corona; sunlight; ultra-violet and external ozone. Naturally, the cable should be designed to meet these exposures.

There is probably a construction that will meet these conditions. The size of conductor should be chosen, first, for the voltage regulation required; second, for its ability to carry the required number of amperes without rising above a safe temperature.

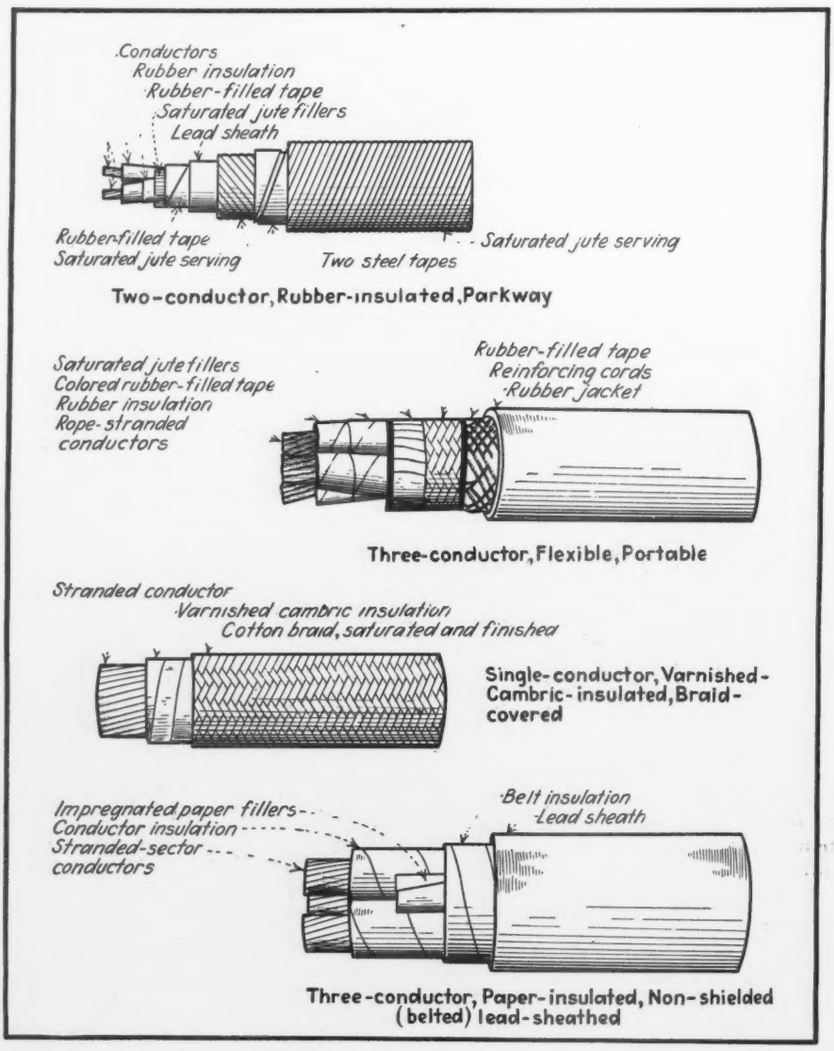
Insulation should be chosen, first, to meet the temperature conditions under which it must operate; second, to meet the electrical conditions, such as voltage; third, to meet the mechanical exposures, some of which have been listed above. The type of insulation usually determines the maximum permissible temperature.

Protective coverings over the insulation should then be chosen to protect it and the conductors.

Sometimes the insulation and protective covering can, and should preferably, be chosen in combination to meet the exposures. However, the space available in which the cables are to be installed, possible mechanical damage during or after installation, and the over-all economy of the job itself, must not be overlooked.

The choice between three single- or one three-conductor cable for three-phase circuits usually depends on economy, space available, convenience in keeping storeroom stocks, length of conduit runs, and other considerations. Sometimes the lower reactance of the three-conductor cable becomes a factor, by providing better regulation. If the cables are lead-sheathed or armored, the sheath and armor losses of single-conductor cables, especially in the large-conductor sizes, must be taken into account.

Sheath losses for three-conductor cables on balanced circuits are negligible.



They Specify Requirements

The current-carrying capacity of three single conductors in one duct is about the same as that of one three-conductor cable of equal conductor size. If the three conductors are installed in separate non-magnetic ducts, the carrying capacity is 35 to 50 per cent greater.

Some competent engineers recently have expressed the opinion that they obtain more satisfactory selection of cable, when the size of the conductors and the make-up of the cable are in doubt, if they prepare functional rather than detailed design and construction specifications. They do not specify size of conductor, type of insulation, or outside protection, unless certain limiting conditions demand these requirements.

Instead they prepare a detailed specification of the conditions under which the cable must operate and indicate the load each cable must carry, with the voltage, frequency, and distance. In addition they specify the installation conditions, such as whether the cable will be in conduit, ducts, or pipes; the grouping and how exposed; temperatures, and other conditions. Then they request the manufacturer to quote on a cable most suitable for these conditions.

It is claimed that by this procedure they are much more likely to obtain the benefit of the latest developments. This procedure also makes it possible for the manufacturer, who is certain to be more familiar than anyone else with the quality and suitability of his own product, to use his judgment and his experience in selecting the proper cable for each purpose.

Won't Have Dust

ARTHUR VAN VLISSINGEN
Consulting Editor

A JULY article described some of the air-conditioning installations at the Ford Motor Company. There are other places where the air treatment is primarily ventilation, whether draft or exhaust.

Good example is the foundry, which is one of the largest in the United States. Mechanical sand slingers, conveyorized molding tables—every facility for fast work results in a great deal of dust being discharged into the air. The atmosphere of the various rooms is, however, abnormally clear for a foundry, whether it be molding, pouring, core making, what not.

One reason is that the building itself is designed for excellent natural ventilation, with unusually high roof and turret ventilation at the top. More important, at points where dust is naturally raised it is done away with by ducts and blowers.

But Never a Draft

For instance, where sand is being dumped in quantity, exhausts operate to clear the air. And where, as in front of a core oven, abnormal heat and dust are inevitable, they are taken care of by forced ventilation of incoming warmed air. At this particular point, ducts come down from above with their openings just above and in front of the workman's head. There is very little draft upon him directly; the current of warmed air flows right past his head and blows the dirt and heat back into the core oven.

Method Fits the Job

This same arrangement, always with the spout so aimed that it blows warmed air past the man and removes the nuisance is to be seen at a dozen or more places scattered through the foundry.

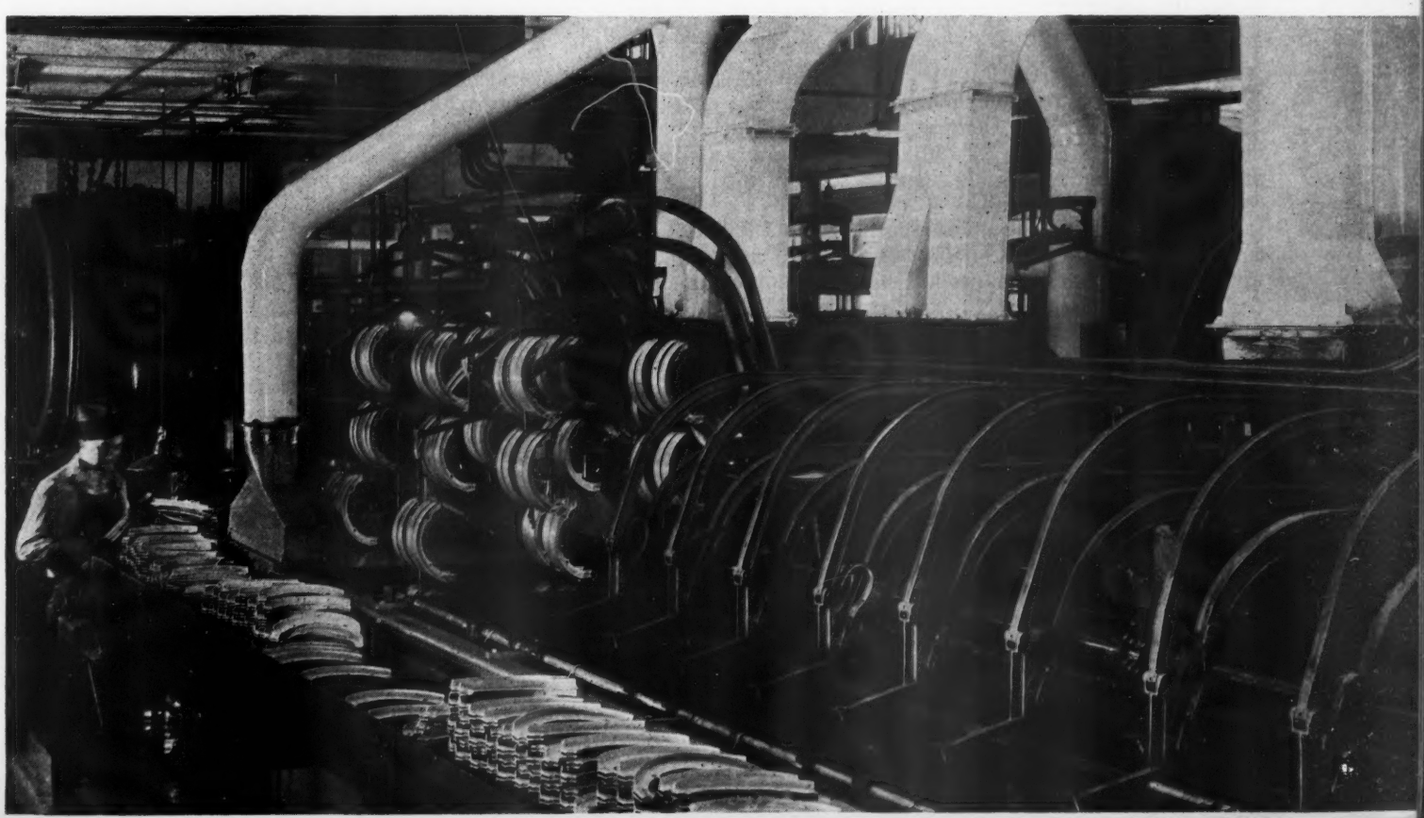
Fumes from pickling and plating operations are also disposed of by ventilation. The method varies with the operation. In the opinion of Ford engineers each fume removal problem must be handled as an individual project, even to the methods of resisting corrosion in ducts and blowers. Magnitude of the problem is indicated by the fact that more than 50 tons of acid are used daily during peak production.

Materials for lids, hoods, and ducts in acid-fume exposures are selected to meet the conditions. In some places, corrosion-resisting metals of high nickel content are employed with excellent results. In others, less expensive materials such as galvanized sheet metal are satisfactory if treated with an asphalt-base, corrosion-resistant paint inside the duct or lid.

Experience has also shown where it is advisable to treat the blowers. The general rule is that if a blower will last six months untreated, it is better to use it unprotected and replace it as necessary. If the life is under six months, protective treatment reduces the cost.

In the foundry air warmed sufficiently to prevent chilling is blown past workers in hot places

Fumes aren't given a chance to get into the air, in the plating departments. Here parts are plated with cadmium



Weather or No

LEWIS K. URQUHART
Associate Editor

HEAT AND HUMIDITY hold few terrors for employees of the Apex Hosiery Company. It may be 90 in the shade in Philadelphia, but it is sure to be 10 degrees cooler in this textile mill. Incidentally, this is a mill that has been conditioned for comfort. Here it's air conditioning *first* for people, *second* for products, *third* for profits.

Results after two years' experience are gratifying. Absences have been reduced throughout the year—in summer because the mill is a pleasant place to work in, in winter because colds and related illnesses are less common.

The mill is not 100 per cent air conditioned. Because of the great amount of heat in the forming room, refrigeration has not been applied. Here the atmospheric control consists of evaporative cooling with proper distribution of air so that the air heated by the hot-water and steam drying forms is displaced by cooler air. The air distribution is such that, although there is a very rapid air change, no employee is in an appreciable draft, and there is no danger of the finished hosiery being blown about.

No Fog in the Dyehouse

Nor is the dyehouse cooled. It is, however, supplied with warm dry air to dispel fog. Formerly a man could not see his hand before his face in this room. Now he can read thermometers and gages without difficulty. Color shades are being maintained more uniformly. There is less danger of accidents.

Again, there is far less corrosion. Motors, conduit, and switch handles, some of which used to require replacement every third year, look about as good as they did two years ago. And there is less danger of goods being stained by condensation dripping from the ceiling.

Complete air conditioning, on the other hand, is found in the wareroom shown in the photograph. Here the hosiery is paired, labeled, stamped, and boxed. Pairing is better. And in these days when buyers expect neat packages, the twelve operations required to fold and box every three pairs of hose are performed with more accuracy and greater dispatch.

Also, the room is cleaner, and that counts with a product of this nature. Of course it means that plant cleaning costs are a great deal lower than they used to be.

Give Unit Heaters a Break

You can profit, too, through more satisfactory service and greater fuel economy, if you will select the right units, locate them properly

C. E. SCOTT
Engineer, Carrier Corporation
Newark, N. J.

LAST MONTH'S article dealt with some of the natural laws governing the transmission of heat and the behavior of heated air, which must be considered when selecting and installing unit heaters. Among other factors that may influence choice or operation of a heater, noise is one of the most obvious.

The sound level of a unit heater is difficult to describe or to translate into the experience of others. What is quiet to one person may be noisy to another. Noise is affected by many factors, chief of which are its intensity, frequency, and the absorptive power of the surrounding media. Sometimes the disposition of the user is an important factor. Until a suitable code has been evolved, it would be well to refrain from trying to express the sound level of a unit heater in decibels.

Fan speed alone is not a conclusive factor of comparison for quietness of operation. No two manufacturers design their fans exactly alike. With propeller fans, some use relatively large diameter and small pitch; others use small diameter and increased pitch. Some use many blades; others few.

Speed Increases Economy

There are just as many varieties of the blower type. Forward-curved blades, backward-curved, straight blades, and curved-inlet blades—all are used. Each of these fans has operating characteristics peculiar to its design, and no one factor, such as speed, can express a true comparison of the relative operating sound level. Therefore, determine the type of fan used before specifying a limiting speed.

Unit heaters are designed primarily for industrial applications, where there is usually considerable noise. If you want the greatest number of B.t.u.'s per dollar cost, select the unit at its highest cataloged speed. This may be 1,160 r.p.m. for some units, 1,420 for others, or even 1,750 for still others. The point is: Practically speaking, there is small difference in the operating sound levels of various makes (assuming that the units are of equivalent capacity and within the same class—propeller or blower) when selected at their highest cataloged speed.

Some may require more power than others, but it is well to compare outlet velocities because, as was shown in the preceding article, high outlet velocity contributes greatly to effective coverage and economy.

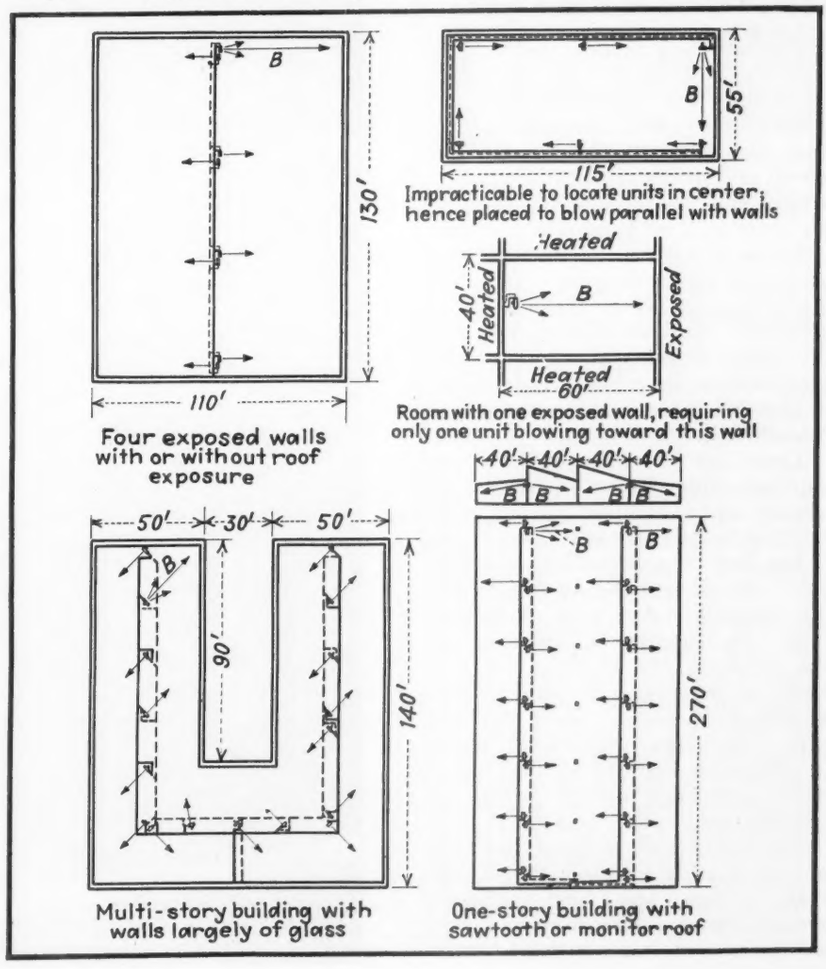
When selecting speed, keep these points in mind:

1. For greatest B.t.u. capacity per dollar of cost (where sound level is not critical), select units at highest cataloged speed.

2. For applications where sound-level performance is semi-critical, select units at approximately 75 per cent of highest cataloged speed.

3. For applications of critical sound-level performance, select units at half highest cataloged speed.

Figure 1. Typical locations of propeller-type unit heaters in industrial areas



4. For best all-round satisfaction, select units equipped with two-speed motors.

The dividing line between high and low steam pressure is usually considered as 15 lb. By far the greatest number of applications range from 2 to 10 lb. When the unit is connected to outside air the steam pressure *at the unit* should *never* be less than 5 lb. When high-pressure steam is to be used, check the steam operating pressure and temperature warranted by the manufacturer of the unit.

Low pressure means low steam temperature, which in turn provides for low outlet air temperature. Low outlet temperature is conducive to greatest heating economy.

When high-pressure steam is used, there are two important factors to consider: (1) Outlet air temperature; (2) outlet air velocity. If velocities are low, see that the outlet temperature is low; an upper limit would be 135 deg. F. If, however, the outlet velocities are high (around 2,000 f.p.m.), it is not uncommon to permit an outlet temperature of 150 to 160 degrees.

Don't Guess at Heat Losses

Whether high or low steam pressure is used, make an effort to select units that will give low final air temperature (with suitable allowance for velocity), as high a fan speed as consistent with the application, and keep the units as near the floor line as conditions permit.

The only one way of knowing for sure what the heat losses of a building amount to is to make a B.t.u. estimate. Transmission factors for the flow of heat through various construction materials are available in the A.S.H.V.E. Guide and other reference books.

There are short-cut methods for approximating the losses, but for an efficient and economical job one must actually know what the losses are.

The first step, therefore, is a survey. All dimensions of the building should be taken with reasonable care. Do not guess at the sizes of the windows, the thickness of the walls, or whether one wall adjoins a heated building. Find out for sure. An extra hour or two spent in making a real survey may mean many additional dollars saving in heating cost.

Fix fairly well in mind the type of unit that it is desired to use, and then design the heat estimate around the performance of this unit as shown in the table entitled "Average Temperature Variation per Foot of Elevation Above Floor," in the preceding article. Remember that there *is* a difference in stratification and that heat losses with some units are less than with others.

Not All Alike

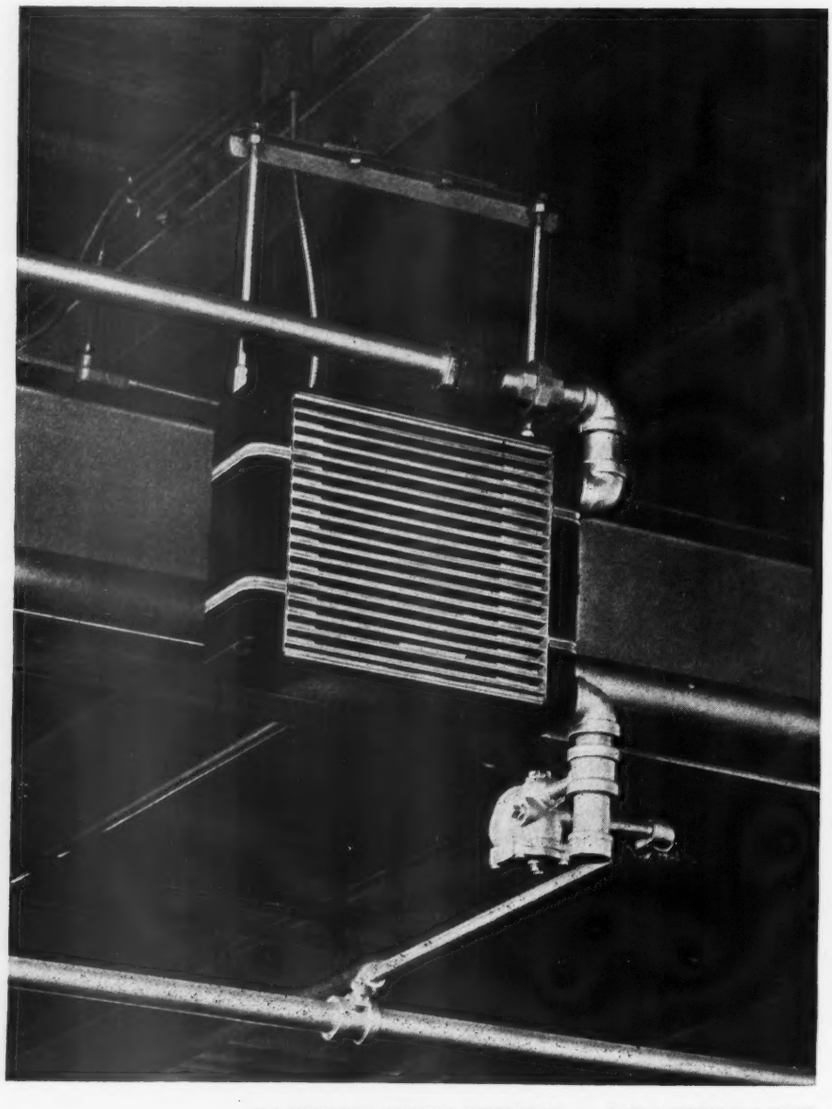
Average wall temperatures and average roof temperature should be corrected to suit the unit being used. If with one class of unit these averages are less than with another, the former will consume less fuel for heating. It is a great mistake to assume that all unit heaters will give the same degree of performance. They will not; there are differences in distribution, diffusion, and economy. The estimator should take this fact into account.

The basic capacity of a unit heater is the number of B.t.u.'s it will produce per hour at an entering air temperature of 60 deg. F. and a steam pressure of 2 lb. If either or both of these factors change, the capacity of the unit will change in accordance with a table of constants which each manufacturer provides.

It is important to note that the room design temperature is not always the actual temperature of the air entering the unit. The room design temperature is taken at a level 5 ft. above the floor. When determining the capacity of the unit, the entering air temperature should be corrected to correspond to the height of the air intake.

For example, assume that a room is to be heated to 60 deg. F. This means that at the 5-ft. level the temperature will be 60 deg. F. A propeller fan unit located 9 ft. above the floor is to be used. From the table in the preceding article, it will be seen that the variation per foot of elevation is 1 deg. Conse-

It's a propeller-type unit



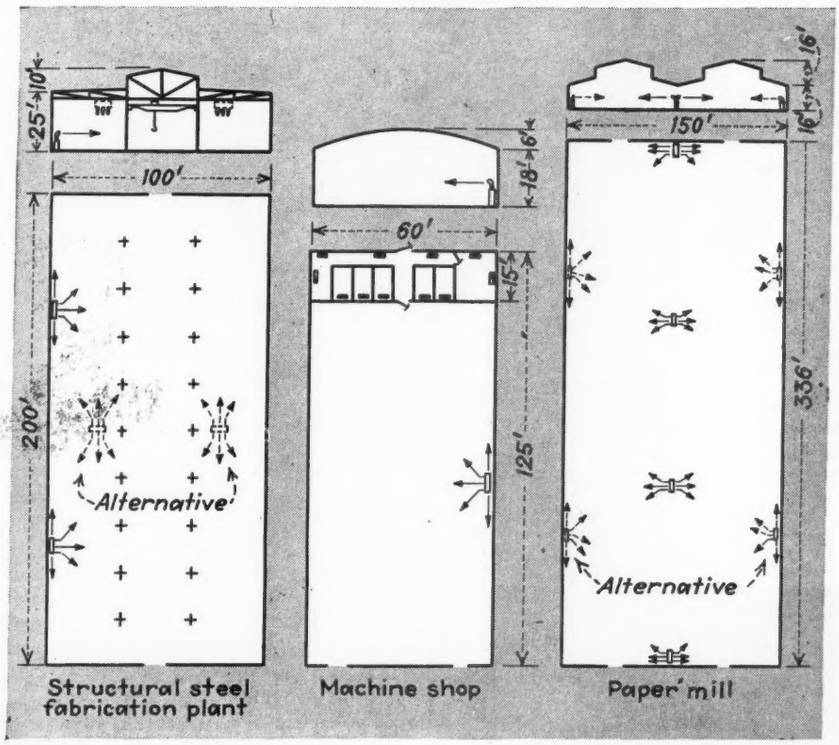


Figure 2. Typical locations of blower-type unit heaters in three kinds of plants

quently the entering temperature, T, will be:

$T = 60$ deg. $+ (9—5)\ 1 = 64$ deg.

A unit should then be selected that will produce the estimated B.t.u.'s when the air entering the unit is 64 degrees.

Better Use a Thermostat

Select units at their highest speeds for minimum cost per thousand B.t.u. As mentioned previously, high velocity is preferable to low velocity, and low outlet temperature is to be preferred unless the outlet velocity is high enough to compensate for it. Keep the intakes as near the floor line as possible. Select large-capacity units so as to keep the total number small and thus decrease installation cost.

If blower-type units are chosen, it is well to consider seriously those which are equipped with bypass dampers. They permit constant operation of the fan to keep up circulation and air distribution, but consume a minimum amount of steam because the air is automatically heated only enough to balance the heat leakage from the room.

Thermostatic operation is to be preferred to manual control.

Be sure that the units have been tested and rated by the manufacturer in accordance with the Code for Testing and Rating Unit Heaters, established by the American Society of Heating and Ventilating Engineers.

Definite rules cannot be set down for the location of units which will apply to all installations, but there are some general considerations which should not be overlooked.

Two general types of locations are:

1. Units are located along the exposed walls with some of the outlets discharging parallel to the wall and others discharging toward the center of the room to overcome roof losses.

2. Units are located along the center aisle of the room, discharging toward the exposed walls.

Preferred Location of Units

It is better to direct the discharge from the units so that rotational circulation of the entire room contents is set up by the system, rather than to have units discharge in counter directions.

Other points to keep in mind are:

1. Units should be located with their outlets as near the floor line as possible, consistent with distribution of the warm air immediately above the heads of the occupants. Standard practice is to have the center of the outlet about 9 ft. above the floor line. At greater heights the effective blow and coverage are diminished by the necessity of directing the air sharply downward.

2. It is advisable to place units near shipping platform doors or other places where large infiltration of outside air may occur, and to discharge directly at the sources of infiltration.

3. Locate units as near the boiler as possible to cut down on piping. In multi-story buildings locate the units on each floor directly above the units on the floor below.

4. In general, select large-size units so as to use the fewest number, which means decreased installation costs and minimum cost per 1,000 B.t.u. However, an exception to this recommendation is found where the nature of the industry (such as work on sewing machines) requires that the occupants (particularly women) be concentrated near the outside walls for maximum light. For such applications it is better to use a larger number of smaller-size units, located closer together and flooding the exposed walls with warm air. This arrangement will prevent the movement of cool air across the lower extremities of the workers, who are usually seated.

Figures 1 and 2 illustrate good-practice locations of propeller and blower units in various types of industrial areas.

(In a succeeding, and final, article piping diagrams for unit heaters will be discussed.—Ed.)

Foremen and Grievances

EXPERIENCE in union-management cooperation shows a gap in management's own ranks, between top management and foremen. Union-elected shop committeemen meet with top management to consider matters listed as grievances by the union, and they receive definite answers. Foremen should have the same answers.

One company bridges the gap by holding monthly meetings with all foremen and superintendents participating. Two weeks before each meeting the foremen are asked to write out all questions they want top management to answer. In the meeting the chief plant executive gives the answers with appropriate explanations. In this way the foremen get the answers, the same answers given to union representatives. *Charles B. Gordy*

1. There's little difference between day and night in this stockroom, lighted by Stock-bin-lite reflectors. They are spaced 5½ ft. apart, use 150-watt clear lamps

2. In a machine tool plant operators are given 30 foot-candles on the work by 400-watt, high-intensity mercury lamps in reflectors with glass diffusing shields. Spacing varies from 13 to 15 feet

3. Here a lot of foot-candles are needed in one spot, and they are provided by local units consisting of an aluminum reflector containing a 100-watt lamp. An adequate level of general illumination prevents eyestrain and accidents

4. Drafting tables in an instrument manufacturer's plant get 35 foot-candles of practically shadowless, indirect illumination from a Light-Hood unit 50 ft. long. It uses 150-watt lamps spaced on 30-in. centers

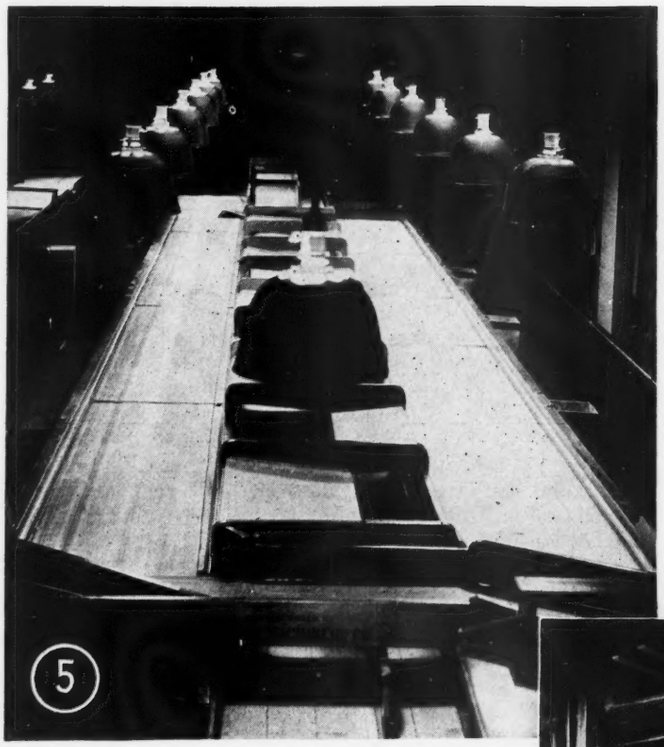
Benjamin Electric Mfg. Company

Their Light

Westinghouse Lamp Division, Westinghouse Electric & Manufacturing Company

Incandescent Lamp Department, General Electric Company

Curtis Lighting, Inc.



5. These units put an intensity of 46 foot-candles right where it's needed—in this case a conveyor for inspecting citrus fruit. Each unit contains a 150-watt lamp

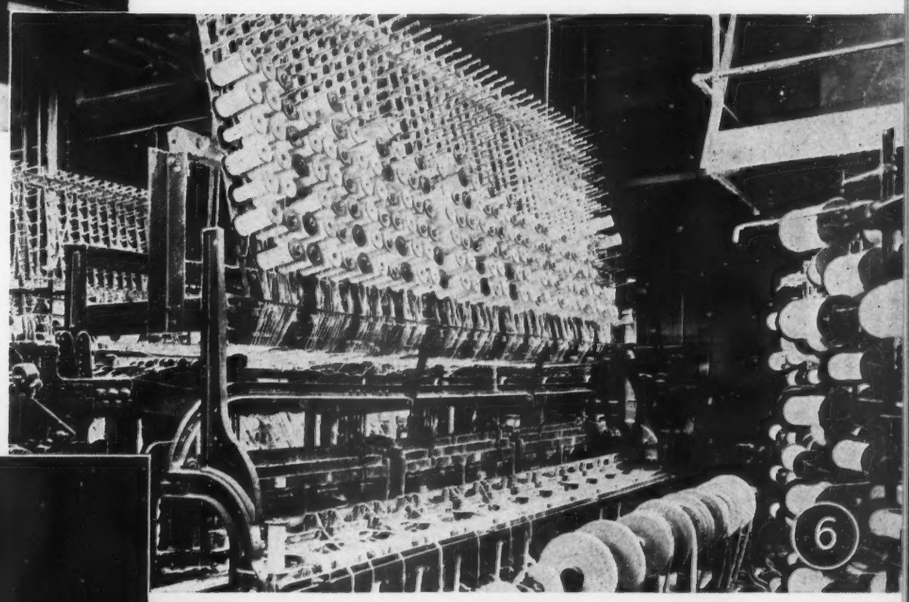
6. Asbestos weaving is another operation that calls for plenty of light. An intensity in excess of 20 foot-candles is provided in this plant by 400-watt, bulb-type mercury lamps in diffusing reflectors

7. Night handling of freight has been speeded up and accidents reduced by better illumination of this shipping platform. Stocklite units with 150-watt lamps give an average intensity of about 12 foot-candles

8. No dark spots in this shop—the assembly department of an electrical manufacturer. Aluminum-reflector, high-mounting units with 300-watt, bowl-enameled lamps throw 30 foot-candles on the benches. Mounting height and spacing are both 10 feet

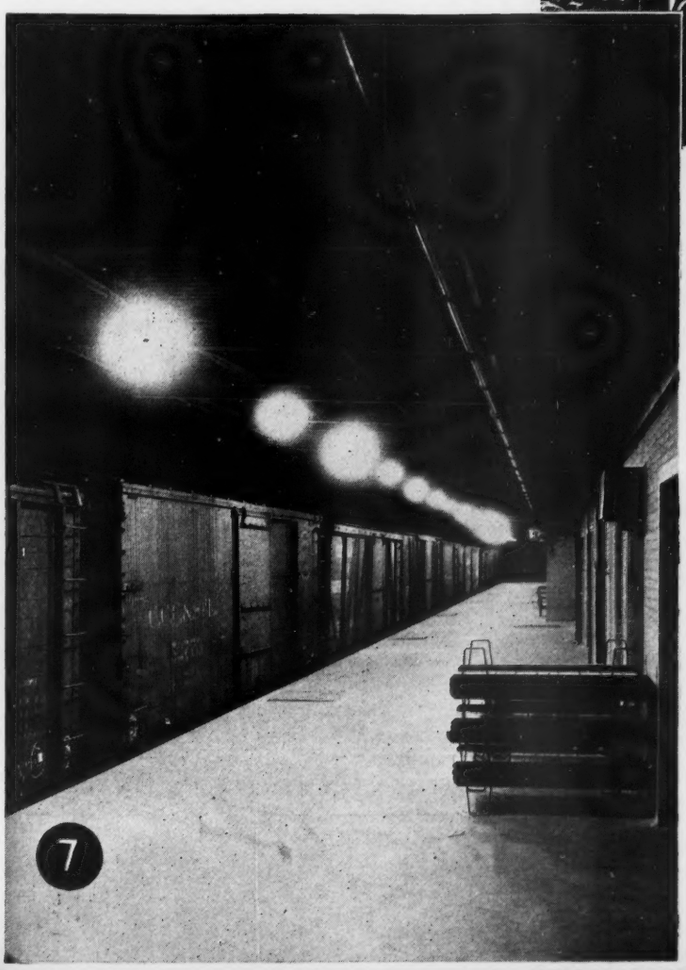
Holophane Company, Inc.

Is Right



General Electric Vapor Lamp Company

Goodrich Electric Company, Inc.



Wheeler Reflector Company

It Pays to Test Motors

Checking the load and condition of motors makes it possible to run them efficiently, keep power factor up, find defects quickly

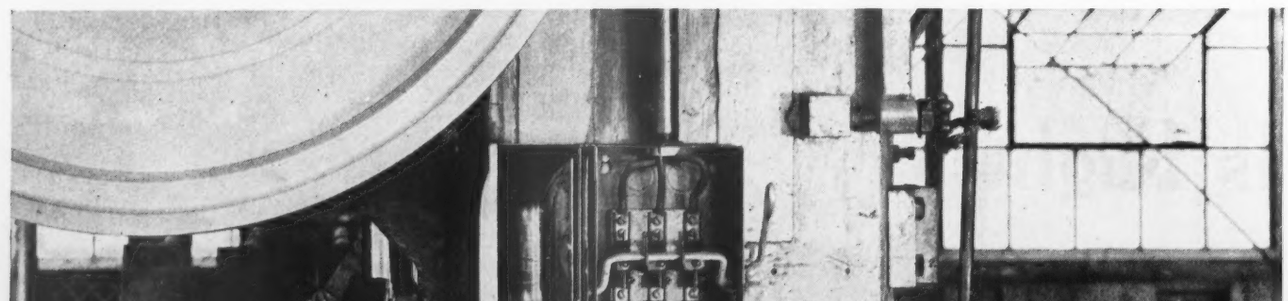
D. S. CASLEY
Chief Electrician, Ames Baldwin Wyoming Company
Parkersburg, W. Va.

ANALYSIS of operating conditions through frequent tests of motors has, during the past three years, improved our plant efficiency, increased production, and reduced repair expense. In addition the data secured have made it possible to build up a card index showing operating conditions and maintenance required by each motor in the plant.

For this work we have used a portable kit of a.c. instruments. It has proved to be the most valuable tool in the plant, and has paid for itself many times.

A card index record is now maintained for every motor in the plant. The data on this card consist of: Load condition, including amperes and voltage per phase, power factor and kilowatts; date of test and inspection; date of repairs, with reasons for and cost of such repairs. The load condition on each motor index card is marked Normal, Overloaded, or Underloaded, and indicated by a check mark. These data are taken twice a year and enable us to make any desired study of each individual motor.

In many instances it has been possible to interchange overloaded motors with underloaded motors easily and without any alteration in the speed of the driven equipment.



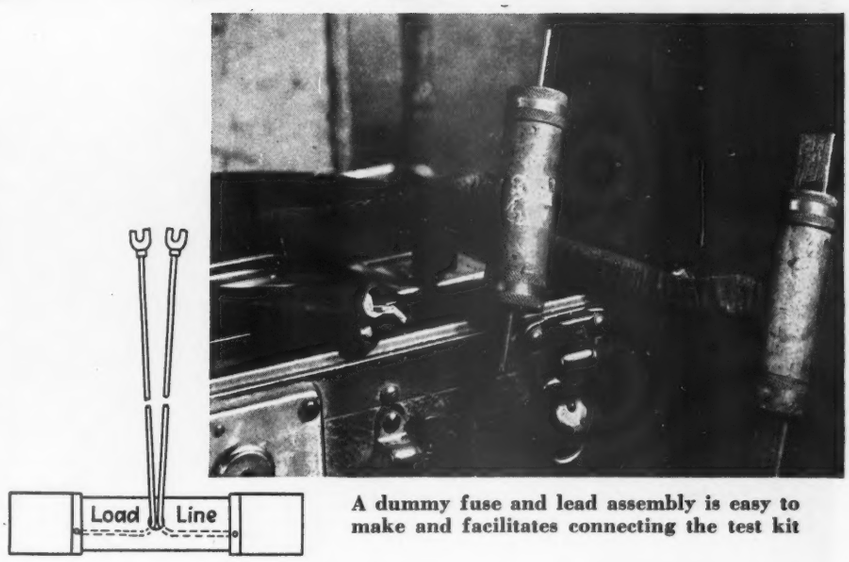
In a few cases changes in the motor pulleys have been necessary.

When we purchase a motor or a machine, the motor index record is checked to determine whether one of the present motors can be used; if so, we purchase a motor to correct an existing unsatisfactory operating condition. Furthermore, such information helps greatly in properly applying spare motors shipped to Parkersburg from another plant.

Our experience with a number of motors shipped from another plant has led us to check each one to determine whether any coils have been cut out, or improperly grouped, or whether other defects are present that may cause unbalanced conditions.

As a typical example, a machine with a rebuilt motor was received from another plant, and when it was placed in service the motor stalled and blew the fuses. While checking the motor with the machine running idle, the instruments indicated unbalanced phase conditions. It was found on inspecting the winding that the coils were improperly grouped. The electrical repair department now checks all motors thoroughly, especially after they have been rewound, before releasing them.

The motor record also indicates voltage conditions in the different sections of the plant. In some instances when it has been found that a main feeder circuit was overloaded, another feeder circuit has been used and the load divided into two sections, which in turn gave more flexible distribution. In addition to improving the voltage conditions, proper loading of the motors greatly improved the power factor in these sections of the plant.



A dummy fuse and lead assembly is easy to make and facilitates connecting the test kit

Special attention has been given to the matter of quickly connecting the instrument kit in the motor circuit while the equipment is operating. We now use three special sets of leads with the different sizes of fusible disconnecting switches. These are made up by removing the fuse link from a 60-amp. fuse, say, and drilling a hole in the center of the fiber case to accommodate two flexible leads, as shown in the sketch. The line and load leads are brought through the hole and soldered to the fuse blades or ferrules. One end of the fuse is marked *Line* and the other end *Load*. The leads are of different color, so that they can easily be distinguished.

It is suggested that the load end of the fuse and the load lead be painted white, with the line end and lead red. Two such dummy fuses and leads are required for each set.

When making a quick check of a motor in service, the line and load leads of the dummy fuses are connected to the terminals of the instruments. Then the disconnecting switch is pulled, fuses are quickly replaced by the dummy fuses, and the switch is closed, with very little interruption of service. A glance at the instruments shows whether the motor is overloaded, or the phases unbalanced.

We've Come a Long, Long Way

D. W. ROBERTS
Mechanical Engineer, Indianapolis

TO ME THERE is no more astonishing development of the last twenty years than the complete about-face in men's feelings about industrial safety. I don't know of any other instance in history where the habits and conditions of a whole nation have been largely made over in one generation.

It has not been done without a great struggle, but it has been done, and on the whole pretty thoroughly done.

I can remember the time, though, when the man who did not take chances was looked down upon as a mollycoddle.

Twenty-five years ago I worked as an electrician's helper during the construction of a steel mill. I was working for a contractor who installed the switchboard, switchgear, bus work, cables, and wiring in the power house. It was a big job. Almost 100 tons of copper went into the buses alone, and at that the bulk of the work was for 6,600 volts.

Frank, the electrician to whom I was assigned, was a wonder. In one year he taught me half of what I have learned in a lifetime. He could do more work in a day than any man I ever met before or since, and do it as well as most, which is phenomenal in a "speed artist."

One day I said, "Frank, why are you working over here? I know you liked your job with the steel company better than this work. Why aren't you working for them now? Couldn't you and Harry get along?"

"We didn't have any trouble," Frank replied. "Harry is the best foreman I ever worked for. I'll tell you why I am not working for him. I'll never work in a gang where I can't do anything any other man can do, and that man Harry certainly kept me stepping to keep up with him. But when he walked a guy wire across the big slip where the ore boats unload, and carried back a coil of wire on his shoulder to save sending someone all the way around the turning basin and delaying the gang an hour, I was beat. I couldn't do that so I quit."

We have come a long, long way in the past twenty-five years.

You'd Scarcely Know the Old Shop Now

THESE TWO photographs are authentic "before-and-after's." Before painting. After painting. They are typical of what a coat of paint—or maybe two—can do. Paint takes literally years off a plant's age. Although it isn't so much the effect on the plant as it is the effect on the people who have to work in it. The problem is to get the right combination of light and color. It does things to people's morales. Does things that don't show up as *Painting, beneficial effects of* on the annual statement. But they're there just the same.

Another thing. No one can say about paint: "It's all right for the other fellow. But you see my business is different." Paint, it happens, is available to big plant and little plant alike.

Sherwin-Williams Co.

A. C. Wave Windings

Connecting diagrams and tables for windings having seven slots per pole per phase

A. C. ROE

A PRECEDING article in the June issue dealt with a.c. wave windings having 6½ slots per pole per phase. With this article are presented the connection diagram, Connecting Table XI, and Checking Chart XI for wave windings having seven slots per pole per phase.

The connecting table covers rotors that have from 4 to 24 poles, and from 84 to 504 slots, in the combinations of slots possible in this range. The checking chart makes possible the location of leads in any position that may be required and that will conform to the rules given in preceding articles.

Wedge As You Wind

The majority of strap, a.c., wave-wound rotors have the coils retained in the slot sections by fiber wedges, with the end windings held by steel wire bands. Some of the tricks of wedging will be discussed in this article.

Regardless of the number of conductors per slot and the type of slot, it will be found advantageous to put in wedges as the winding progresses; that is, after placing the first double throw of coils, put in a number of wedges about each quarter point of the winding, as in the photograph, which shows a four-conductor-per-slot, strap, a.c. wave winding with the cells trimmed and the wedges in place on part of the winding.

Wedging as the winding progresses has the advantage of preventing the straps from falling out of the slots, particularly on the under side, since the top halves of the throw coils are not inserted until all coils are in place and these coil halves tend to pull the remainder of the winding out. Also, by wedging up close to the last coils inserted, as shown, a firm foundation is obtained which helps considerably when driving in the last strap of the top coil half.

Another procedure that helps is to tighten up the bottom straps by driving fillers between them and then place a fiber strip the full width of the slot, over the bottom straps. These strips are shown in the lower part of the photograph. It is important to make these fiber strips wide enough to be a driving fit. The strips are pushed through the slot from one end and slightly tilted; then a T-slot drift is used to drive them flat and tighten the bottom straps in the slot.

Tighten Straps With Fillers

Driving down and locking the bottom straps in place with depthwise and widthwise fillers is a very important item in winding strap coils into a.c., wave-wound rotors, because this procedure provides the maximum depth of slot space for the top coil straps. This space is needed because all straps, particularly those next to the sides of the slot, must be below the point where the overhang starts on the tooth. A study of the diagram showing shapes of slots, in the preceding article in the light

Checking Chart XI. Seven Slots per Pole per Phase

No. of Poles	No. of Slots	Polarity	Phases C							B							A						
4	84	↑	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Z	Y	X	W	V	U
		↓	36	35	34	33	32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16
		↑	57	56	55	54	53	52	51	50	49	48	47	46	45	44	43	42	41	40	39	38	37
		↓	78	77	76	75	74	73	72	71	70	69	68	67	66	65	64	63	62	61	60	59	58
6	126	↑	99	98	97	96	95	94	93	92	91	90	89	88	87	86	85	84	83	82	81	80	79
		↓	120	119	118	117	116	115	114	113	112	111	110	109	108	107	106	105	104	103	102	101	100
8	168	↑	141	140	139	138	137	136	135	134	133	132	131	130	129	128	127	126	125	124	123	122	121
		↓	162	161	160	159	158	157	156	155	154	153	152	151	150	149	148	147	146	145	144	143	142
10	210	↑	183	182	181	180	179	178	177	176	175	174	173	172	171	170	169	168	167	166	165	164	163
		↓	204	203	202	201	200	199	198	197	196	195	194	193	192	191	190	189	188	187	186	185	184
12	252	↑	225	224	223	222	221	220	219	218	217	216	215	214	213	212	211	210	209	208	207	206	205
		↓	246	245	244	243	242	241	240	239	238	237	236	235	234	233	232	231	230	229	228	227	226
14	294	↑	267	266	265	264	263	262	261	260	259	258	257	256	255	254	253	252	251	250	249	248	247
		↓	288	287	286	285	284	283	282	281	280	279	278	277	276	275	274	273	272	271	270	269	268
16	336	↑	309	308	307	306	305	304	303	302	301	300	299	298	297	296	295	294	293	292	291	290	289
		↓	330	329	328	327	326	325	324	323	322	321	320	319	318	317	316	315	314	313	312	311	310
18	378	↑	351	350	349	348	347	346	345	344	343	342	341	340	339	338	337	336	335	334	333	332	331
		↓	372	371	370	369	368	367	366	365	364	363	362	361	360	359	358	357	356	355	354	353	352
20	420	↑	393	392	391	390	389	388	387	386	385	384	383	382	381	380	379	378	377	376	375	374	373
		↓	414	413	412	411	410	409	408	407	406	405	404	403	402	401	400	399	398	397	396	395	394
22	462	↑	435	434	433	432	431	430	429	428	427	426	425	424	423	422	421	420	419	418	417	416	415
		↓	456	455	454	453	452	451	450	449	448	447	446	445	444	443	442	441	440	439	438	437	436
24	504	↑	477	476	475	474	473	472	471	470	469	468	467	466	465	464	463	462	461	460	459	458	457
		↓	498	497	496	495	494	493	492	491	490	489	488	487	486	485	484	483	482	481	480	479	478

of the foregoing remarks should make clear the reason for keeping the winding tight close to the section into which coils are being inserted.

To wedge up the top part of the slot, fiber wedges of various thicknesses and shapes are used. In most instances, however, the wedges are in two pieces and are driven in from each end of the rotor.

To protect the insulation on the straps, the slot cells are trimmed with sufficient margin to permit their being overlapped on top of the coils more than halfway across the slot. Fillers are driven in depthwise between the straps to make them a firm fit; then the cell ends are turned over.

A thin fiber strip is placed over the turned-over cell ends; this strip is in one piece and is as long as the double wedge. It serves as a slide for the wedge, and prevents the turned-over cells from catching and tearing as the wedge is driven in.

The fiber strip under the wedge can be cut an inch or so longer than the wedge and trimmed later; this takes care of any slippage as the wedge is started, and also protects coils from the wedge-driving tool.

A succeeding article will give the diagrams and charts for wave windings having 7½ slots per pole per phase, with some general directions on winding and shaping the coils of a.c., wave-wound rotors.

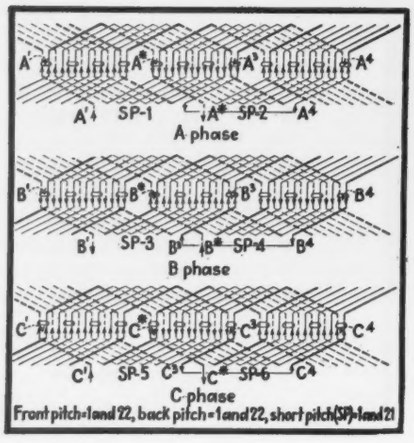
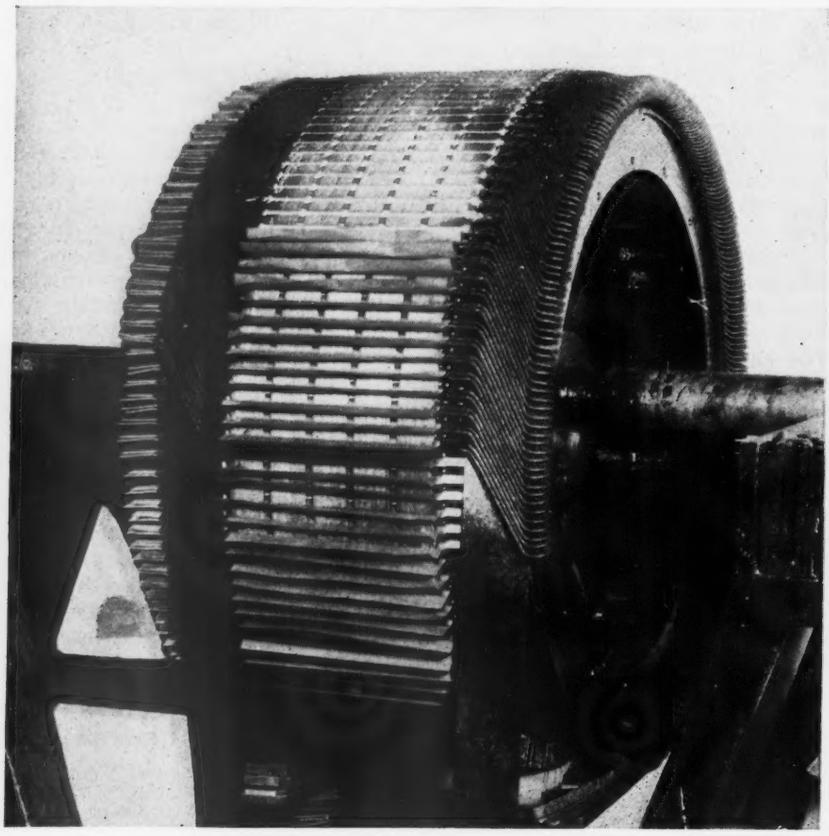


Figure 11. Connecting diagrams for a.c. wave windings having seven slots per pole per phase. These diagrams are to be used with Connecting Table XI. Below, a.c., strap, wave-wound rotor being wedged as the coils are inserted



Connecting Table XI.* Seven Slots per Pole per Phase

No. of Poles	No. of Slots	A Phase: Bottom Leads A¹	A*	Top Leads A³	A⁴	B Phase: Bottom Leads B¹	B*	Top Leads B³	B⁴	C Phase: Bottom Leads C¹	C*	Top Leads C³	C⁴	Short-Pitch Connections SP 1–3–5	SP 2–4–6
4	84	↑ 1	64	58	37	↓ 29	8	2	65	↑ 57	36	30	9	6	6
6	126	↑ 1	106	100	79	↓ 29	8	2	107	↑ 99	78	72	51	6	6
8	168	↑ 1	148	142	121	↓ 113	92	86	65	↑ 57	36	30	9	6	6
10	210	↑ 1	190	184	163	↓ 71	50	44	23	↑ 141	120	114	93	6	6
12	252	↑ 1	232	226	205	↓ 71	50	44	23	↑ 141	120	114	93	6	6
14	294	↑ 1	274	268	247	↓ 197	176	170	149	↑ 99	78	72	51	6	6
16	336	↑ 1	316	310	289	↓ 113	92	86	65	↑ 225	204	198	177	6	6
18	378	↑ 1	358	352	331	↓ 155	134	128	107	↑ 267	246	240	219	6	6
20	420	↑ 1	400	394	373	↓ 281	260	254	233	↑ 141	120	114	93	6	6
22	462	↑ 1	442	436	415	↓ 155	134	128	107	↑ 309	288	282	261	6	6
24	504	↑ 1	484	478	457	↓ 197	176	170	149	↑ 351	330	324	303	6	6

* See Figure 11 for connecting layout. Front and back pitches = 1 and 22. Short-pitch (SP) = 1 and 21

You'll handle more materials faster . . . with EXIDE-IRONCLAD BATTERIES

Truck illustrated made by Baker-Raulang Company

MODERN electric industrial trucks are built for today's conditions—to handle bigger, heavier loads, and to fit the needs of your plant. To bring out the best that's in them, use a battery built for speedy handling of large loads—a powerful, long-lasting, trouble-free Exide-Ironclad.

This is a battery you can depend on to keep your trucks in speedy, uninterrupted operation throughout the day. It has tremendous reserve power on instant call. It maintains a good voltage clear up to the end of the day, providing consistently good vehicle speeds. It keeps out of trouble and on the job, minimizing maintenance costs. And the long life of these batteries is too well known to require additional emphasis.

Why not speed up your material handling service and cut costs with Exide-Ironclad? Write for new, free booklet, "Battery Handling Systems and Equipment."

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BATTERIES
WITH EXIDE MIPOR SEPARATORS
"MIPOR," Reg. U. S. Pat. Off

THE ELECTRIC STORAGE BATTERY COMPANY, Philadelphia
The World's Largest Manufacturers of Storage Batteries for Every Purpose
Exide Batteries of Canada, Limited, Toronto

You want to know

and the editors will gladly tell you more about the things mentioned on this page

• LACQUER, burn-proof, laughs at match flames, lighted cigarettes, and even perfumes and alcohol. It's clear and gold-colored, applied by dipping or spraying, and baking. (9701)

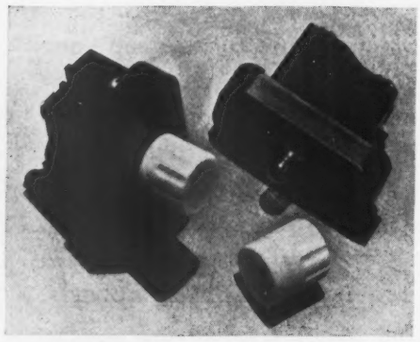
• RUBBER can be vulcanized in 20 minutes by a newly developed process. Not applicable to all rubber vulcanization, it has been used in treating the rubber cover of insulated wire, and can be adapted for other classes of rubber products. (9702)

• "EXCURSIONS in Science and Engineering" is title of the first booklet in a series projected by a large electrical manufacturer to tell the story of its research laboratory and of the adventures going on there. (9703)

• CAST IRON, long an old stand-by but never a spectacular metal, has grown more versatile thanks to heat-treatment technique. A booklet gives heat-treatment fundamentals of plain and alloy cast iron. (9704)

• NON-TAMPERABLE FUSE employs adapter which screws into present cutout bases and prevents insertion of pennies and slugs, use of fuses other than that for which adapter is rated. It combines overload protection and a thermal cutout. (9705)

• TRADE STATISTICS are easier to locate now that a directory of approximately 3,000 statistical series has been published. It covers all statistics prepared daily, weekly, monthly, or quarterly by 40 governmental and 200 non-governmental agencies. (9706)



COMBINATION PUSHBUTTON and indicating lamp is bound to prove popular with machinery builders and users. With dimensions of 2⅝ x 1¼ x 2⅝ in. it needs only half the space required by the two devices mounted separately. The translucent button is available in six colors. (9726)

• METAL AWNING, made of aluminum, is similar to a Venetian blind yet operates like an awning. It can be left up all year and, amazingly enough, the window and screen don't have to be opened to operate it. (9707)

• PLASTIC MOLDING MATERIAL has deep, rich black color which makes it good material from which to mold radio cabinets and other large housings. Large drawers can be made with it, and it can be hard buffed. (9708)

• SAFETY INSTRUCTIONS for employees—reprints of the safety data sheets published in *Factory* in May, June, and July—have been prepared in booklet form. (9709)

• STAINED CONCRETE and masonry, when cleaned, are likely to soil quickly because the steam and sand-blast cleaning methods open up pores of the stone, brick, or concrete. Now comes a non-wax stainproofing and waterproofing material to be applied after cleaning. (9710)

• FLAMEPROOFING MATERIAL eliminates danger of fabrics becoming ignited when they come in contact with open flames. Clear, and harmless to delicate fabrics and colors not affected by water, it is said not to "powder off" or be visible on black materials. (9711)

• HOW one large concern is handling the syphilis problem is told in a government pamphlet. With the drive in progress to wipe out this disease, this publication is especially timely. (9712)

• THERE IS ROMANCE in the story of American industry and it's told in a 100-page handbook of a radio broadcast series on the history and development of certain industries. (9713)

• COATED PAPER is announced as a protective coating for almost anything you want to put it around. A rubber-like substance resistant to acid, oil, air, and light is the coating material. (9714)

• HANGER for blueprints and drawings can bind as many as 75 of them for wall hanging. If the prints must be moved, the hanger can be taken from the wall, the hook turned down, and the whole assembly rolled up. (9715)

HANDBOOKS and references kept on the desk for daily use won't slide down when you take one out, if this self-adjusting bookend is used. Made of walnut, it has two wooden balls fixed to and moving with a concealed, spring-operated sliding device. Books can be taken out or put back with one hand, the balls moving outwards from pressure of inserting a book, inwards from action of the spring when book is withdrawn. (9725)

• OCCUPATIONAL DISEASES — What are the trends from the medical and legal standpoints? A pamphlet presents a statistical and legal analysis of medicolegal experience. (9716)

• SHIPPING CONTAINERS can be made more attractive by use of colored stapling wire that will blend or contrast with printed cartons. (9717)

• DRAWING STAND attaches securely to any table. Height and angle can be adjusted to suit individual requirements. (9718)

• NAME PLATE stamping machine makes name plates up to 8 in. long. Both curved and straight lines can be stamped, and special fixtures can be provided for curved lettering. Letters ranging $\frac{1}{8}$ to $\frac{5}{8}$ in. can be used and replaced. (9719)

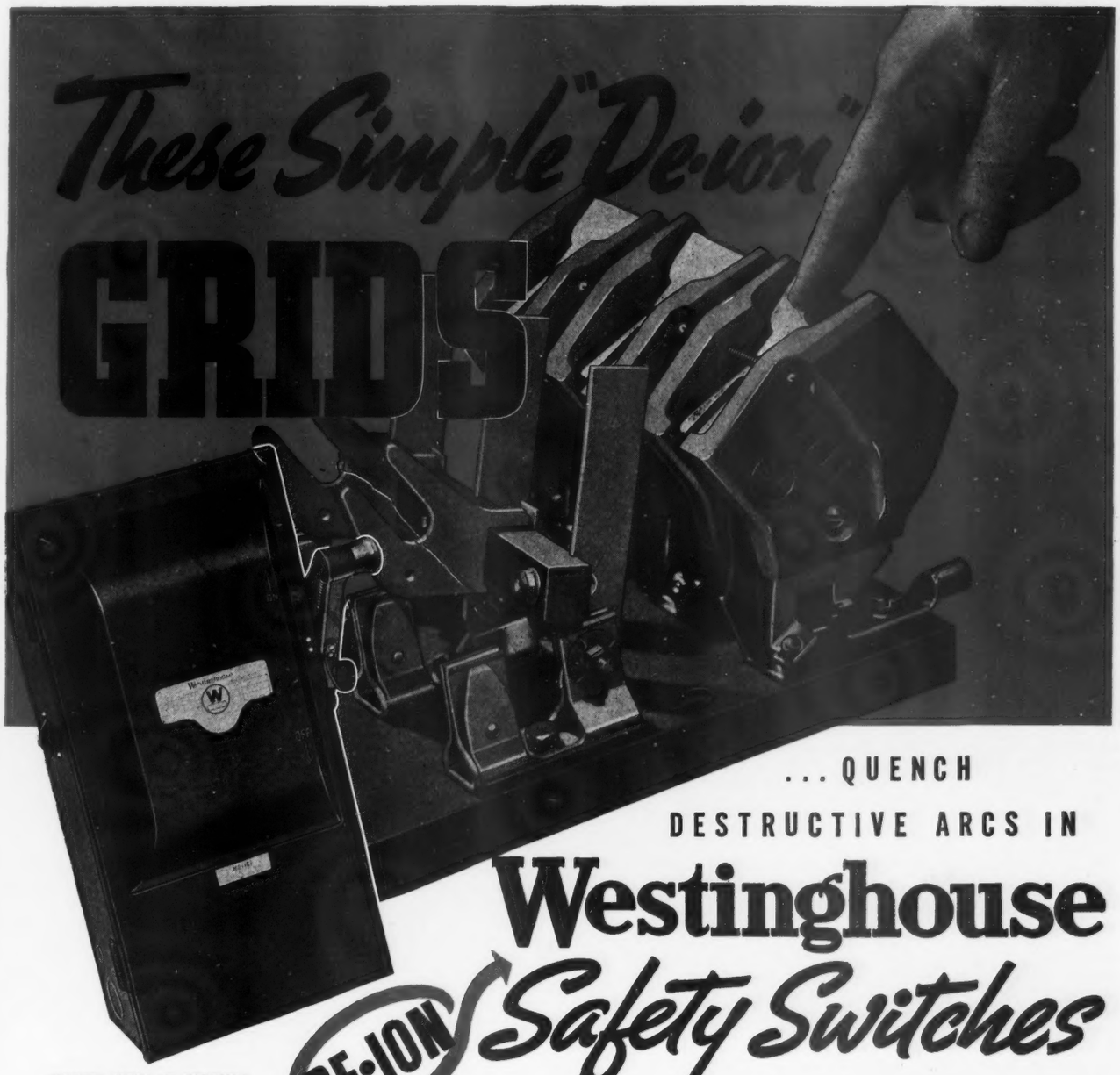
• BELT GAGE measures V-belt circumference, angle, width, and thickness. (9720)

• BOILER SCALE can be removed by a new compound which damages no metal but zinc. (9721)

• CEMENT PAINT, with synthetic resin base, is said to be extremely durable and elastic. No wetting down is necessary before applying it. (9722)

• MORE HANDS than two are needed to manipulate at one time paint can, paint brush, dust brush, scraper, cloth, etc. So to end the painter's juggling comes a combination paint can handle, brush holder, and wiping bar for attachment to paint cans. (9723)

• PRINTING on lacquer-finished or cellulose-derived articles is nigh on to futile. A lacquer-base ink in standard colors is said to make the job possible. (9724)



. . . QUENCH

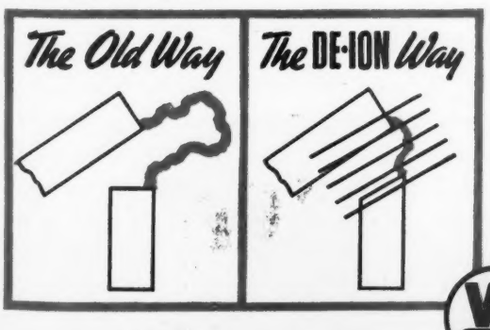
DESTRUCTIVE ARCS IN

Westinghouse

DE-ION Safety Switches

HERE'S HOW IT WORKS!

In the past, arcs have been broken by "stretching." The "De-ion" quencher on 575 and 600-volt Westinghouse switches confines, divides and extinguishes arcs instantly—obviously preventing concentration of burning heat on contacts or arc barriers.



It would be hard to overestimate the importance to safety, long life and low-cost maintenance of the famous and exclusive "De-ion" principle of arc extinction . . . employed in 575 and 600-volt Westinghouse Safety Switches. And it would be unfair to expect similar performance from a high-voltage safety switch lacking this feature.

Perfect contacts are further insured by another exclusive principle of design. The Diamond-Pointed Break Jaw and Extended Blade confine beading to a small area which falls entirely *outside* of the contact surfaces. Thus these surfaces remain clean, bright and close-fitting.

Simplicity and ease of inspection are further carried out through the use of one-piece or milled-and-ground copper parts on a one-piece non-carbonizing composition base. This eliminates most of the customary bolts and screws.

All sizes and ratings, Types A, C and D. Call your nearest:

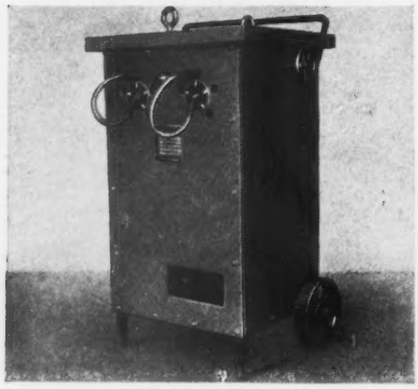
WESTINGHOUSE OFFICE ELECTRICAL WHOLESALER
ELECTRICAL CONTRACTOR MOTOR DEALER

Westinghouse Electric & Mfg. Co., East Pittsburgh, Penna.

J 20302

A SWITCH FOR EVERY PURPOSE . . . AND ★ MOTORS ★ "DE-ION" LINESTARTERS ★ NOFUZE CIRCUIT BREAKERS

What's New in Equipment

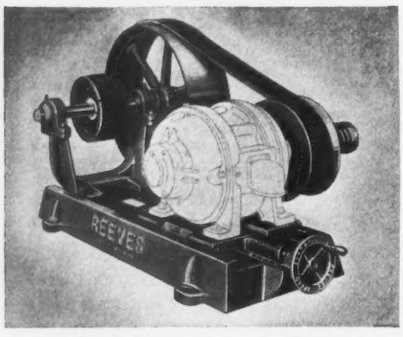


Welder

A 150-amp. a.c. transformer-type arc welder is a complete self-contained unit. Has system of three controls of the welding current. Through use of the first two it is possible to obtain 25 coarse adjustments. The third control offers a further and finer adjustment of current values within any one of the foregoing twenty-five. Wilson Welder and Metals Co., Inc., 60 East 42d St., New York.

Variable-Speed Pulley

New and improved design of countershaft-type, vari-speed motor pulley is a simple, compact unit which is mounted on the standard shaft extension of any constant-speed motor. It forms direct drive from motor to driven machine. Is operated by handwheel control of a sliding motor base. For requirements of either unusual speed reduction or speed increase, a countershaft is mounted on a common base with the rest of the unit. Power take-off may also be from sprocket,



pinion, multiple V-belt, sheave, or any other drive. Countershafts are strong and rigid, with little chance for vibration or twisting. Built in seven sizes, transmitting from fractional to 7½ hp., and covering speed ratios of 3:1. Reeves Pulley Co., Columbus, Ind.

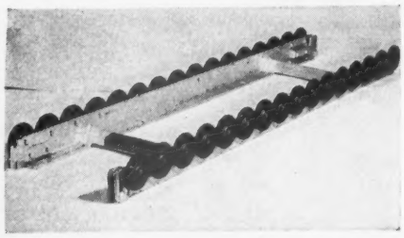
Fire Detector

Vacuum tube fire detector has detector element inclosed in the vacuum tube. It is claimed that sensitivity and accurate calibration are achieved through this design. It is approved for a 15-ft. spacing and for open circuits up to 250 volts; closed circuits to 110 volts. Standard ratings for open circuit are, 135, 185, and 260 deg. F., 110 volts, 0.5 amp.; for closed

circuit, 135 deg. F., 110 volts, 0.5 amp. Other detectors are supplied for operating temperatures ranging from 0 to 300 deg. F. Thomas A. Edison, Inc., West Orange, N. J.

Conveyor Wheels

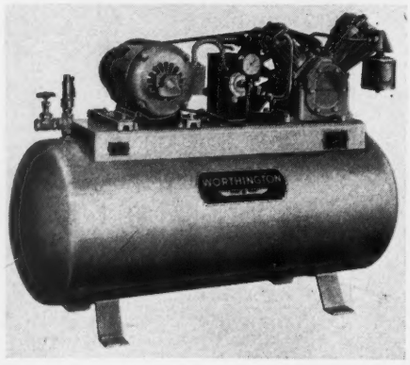
Types 70-RT and 84-RT rubber-tired wheels are intended for use as conveyor rollers. The two types are identical in design and differ in construction only in



that one is larger and heavier than the other. When mounted in light frames they become a conveyor suitable for conveying material which must be protected from jarring or scratching. These sections are available straight or in any practical degree of curvature. The wheels may also be used as casters for light trucks. Of pressed steel construction, they have hardened steel inner and outer ball races. The smaller wheel, which is 2⅞ in. in outside diameter, incorporates ten 3/16-in. diameter hardened steel balls and has a capacity of 20 lb. The larger wheel is 3½ in. in outside diameter and uses eleven 5/16-in. hardened steel balls and has rated capacity of 50 lb. Mathews Conveyer Co., Ellwood City, Pa.

Compressors

Improved line of tank-mounted compressor units. Single-stage units are available with vertical compressors. The motor sizes range from ¼ to 5 hp., with displacements from 1.43 to 67 cu.ft. per min., at a maximum pressure of 250 lb. per sq.in. Two-stage units are available with angle-type compressors. The motor sizes range from ¾ to 10 hp., with displacements from 3.9 to 45 cu.ft. per min. at a maximum pressure of 250 lb. per sq.in. All models have a pressure switch with a



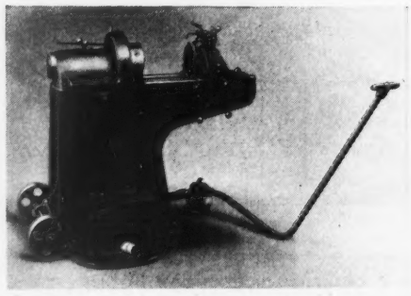
valve for unloading the compressor when starting or stopping. Most models are available with either vertical or horizontal tanks. Worthington Pump & Machinery Corp., Harrison, N. J.

CO_2 Analyzer

"Fuel Ratiometer" for measuring CO_2 and stack temperatures. Can be used for flue gas measurements on oil- and coal-fired boilers and diesel engines. It is a compact, portable unit. Employs Wheatstone Bridge circuit and is calibrated to read in direct percentage of CO_2. Gas sampling line can be connected to the stack pipe as near the check damper as possible. A ¼-in. hole is all that is necessary for the gas sampling line or the thermocouple. Has electrically operated pump to provide continuous aspiration of gas samples to the instrument and continuous determination of CO_2. Wm. O. Hebler Co., 830 Broad St., Newark, N. J.

Pipe Threading Machine

A new mounting has been developed for the 2-in. "Little Landis" pipe threading and cutting machine, so as to permit moving the machine readily from one location to another. Two wheels are used at the rear of the machine and a single guide wheel in a unit with the handle is used at the front end. The guide wheel and handle are detachable in order that no interference from them is experienced by the operator. To move the machine from place to place, it is merely necessary for the operator to raise the handle until the swivel can be hooked into the swivel bracket and fastened to the front end of



ARE YOU THINKING OF *Steel Transportation* ON A BIG ENOUGH SCALE?

Transportation of steel under modern production methods, calls for more than big Trucks built today. Trucks *may* be *built* today, but successful operation depends upon adequate *preparation* to build.

Elwell-Parker has supplied Industrial Power Trucks for handling steel from the time the Industry began using truck equipment at all. For decades this Company has enjoyed the confidence of Plant Engineers responsible for steel transportation.

When trends toward new methods of huge volume production began to take definite form, Elwell-Parker Engineers were prepared by long experience to design Truck equipment of enough *greater* capacity to equal the industry's vastly-increased output.

Elwell-Parker has matched each expansion in mill production with big, capable, trustworthy Trucks of improved standard design—or even brand-new types when required.

Call in an Elwell-Parker Steel Plant specialist. His recommendations, based upon his own and this Company's 31 years' practical experience, will surely help you.

The Elwell-Parker Electric Company, 4323 St. Clair Avenue, Cleveland, Ohio.

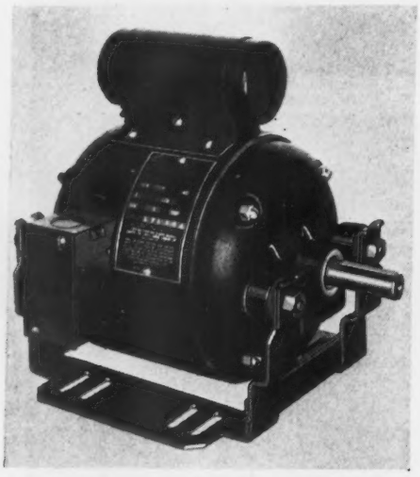
New Type **ELWELL·PARKER** *Trucks*

ESTABLISHED 1893 • BUILDING POWER INDUSTRIAL TRUCKS SINCE 1906

the machine bed. Pulling down on the handle then raises the machine approximately 2 in. from the floor and it can then be wheeled to any desired location. Will thread pipe from ¼ to 2 in., inclusive, or bolts up to 1½ in. in diameter. Landis Machine Co., Inc., Waynesboro, Pa.

Motor

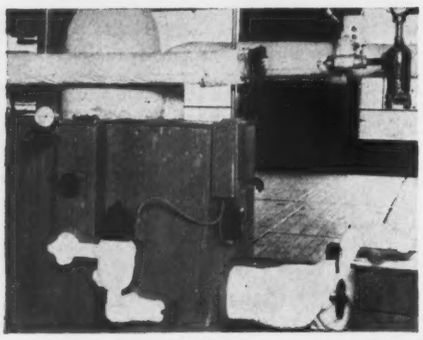
Two-speed, capacitor-start, induction run motor for belt drive. Comes in ratings of 1/6, ¼, ⅓, and ½ hp. High speed of 1,750 r.p.m., and low speed of



either 1,150 or 850 r.p.m. Speed changes are obtained by a three-point switch or bonnet control. This makes possible speed control for belted blowers. Wound for long-hour service, and has low starting current and normal starting torque. The Peerless Electric Co., Warren, Ohio.

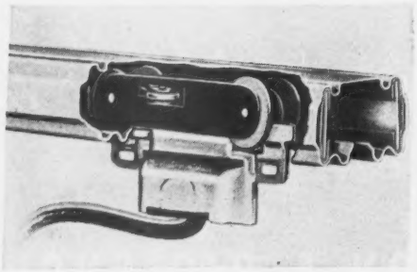
Liquid Level Control

Consists of float chamber and control box and can be used on pressures up to 300 lb. Can be used on brine coolers, boilers, storage tanks. It has no levers, linkages, stuffing boxes, or wearing parts, it is said. One size used on all installations. J. G. Russell Co., 103 Boston St., Boston.



Distribution System

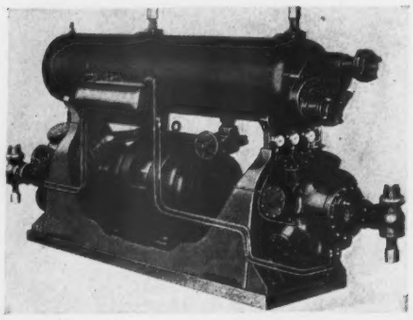
"Universal Type Trol-E-Duct" is a flexible, mobile, electrical distribution system designed for general lighting and light duty power applications. It consists essentially of section lengths of formed steel duct inclosing copper busbars partially wrapped in insulating material. Movable current-carrying trolleys and stationary twistout plugs to which lights, tools, and appliances can be wired are inserted in a narrow, continuous slot extending along one side of the duct. Weight supports also can be inserted in the duct to support lamp fixtures, portable tools, and miscellaneous equipment. With the use of



couplings, elbows, end caps, hangers, and various other fittings, the duct sections can be assembled and installed as a compact, continuous, and flexible distribution system. Lights can be shifted along duct runs to conform with the illumination needs on floor areas. Additional outlets to meet increased light and power demands can be tapped off by simply inserting a trolley or twistout plug in a duct run. It can be installed as a branch circuit in capacities of 15, 20, 25, 35, and 50 amp. Parts can be dismantled and reinstalled in distant locations without any material loss. Cross-sectional dimension of duct is $\frac{7}{8} \times 1\frac{7}{16}$ in. Weight is ½ lb. per linear foot. Bull Dog Electric Products Co., 7610 Jos. Campau Ave., Detroit.

Air Compressor

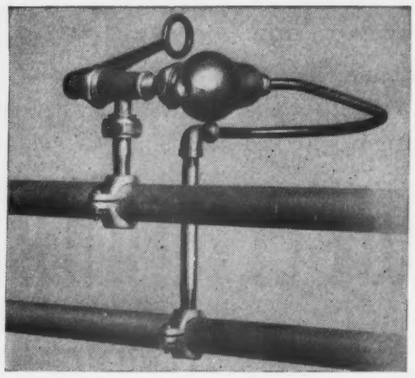
Line of high-speed compressors that turn up to 1,750 r.p.m. utilizes the radial principle of design; cylinders are placed in a circle around the crankshaft. In sizes



from 10 to 75 hp. They are light and compact and can be installed practically anywhere, not requiring a heavy foundation. It is said that operation is extremely free from vibration and that the compressors run quietly. Airtemp, Inc., 405 Lexington Ave., New York.

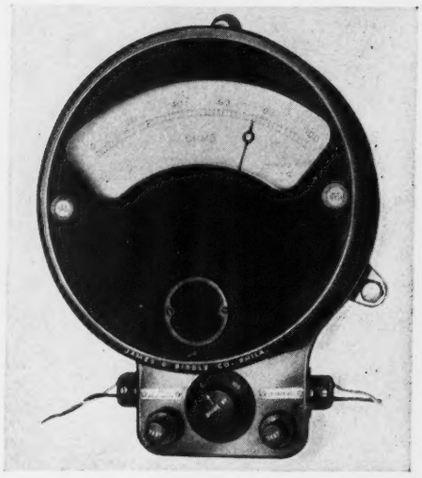
Humidifier

"Turbo-matic" humidifier is automatically self-cleaning and is designed especially for the textile industry. Construction is very simple, with the travel of the two movable members accomplished by



a single diaphragm. Head is so designed that the water nozzle is self-centering. It is said that in or out of operation, no leakage of compressed air into the water lines can occur. It may be installed in any standard atomizer system. Parks-Cramer Co., Fitchburg, Mass.

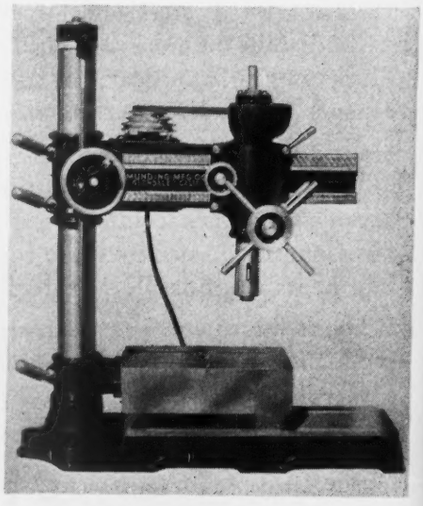
Ohmmeter



"Megger" direct-reading ohmeter for switchboard mounting is available in various ranges from as low as 1/10 ohm full scale up to 100 megohms full scale. Operates on same principle as "Megger" insulation testers, having a cross-coil ohmeter, so the accuracy is independent of the voltage of the external circuit. Operates on d.c. James G. Biddle Co., 1211-13 Arch St., Philadelphia.

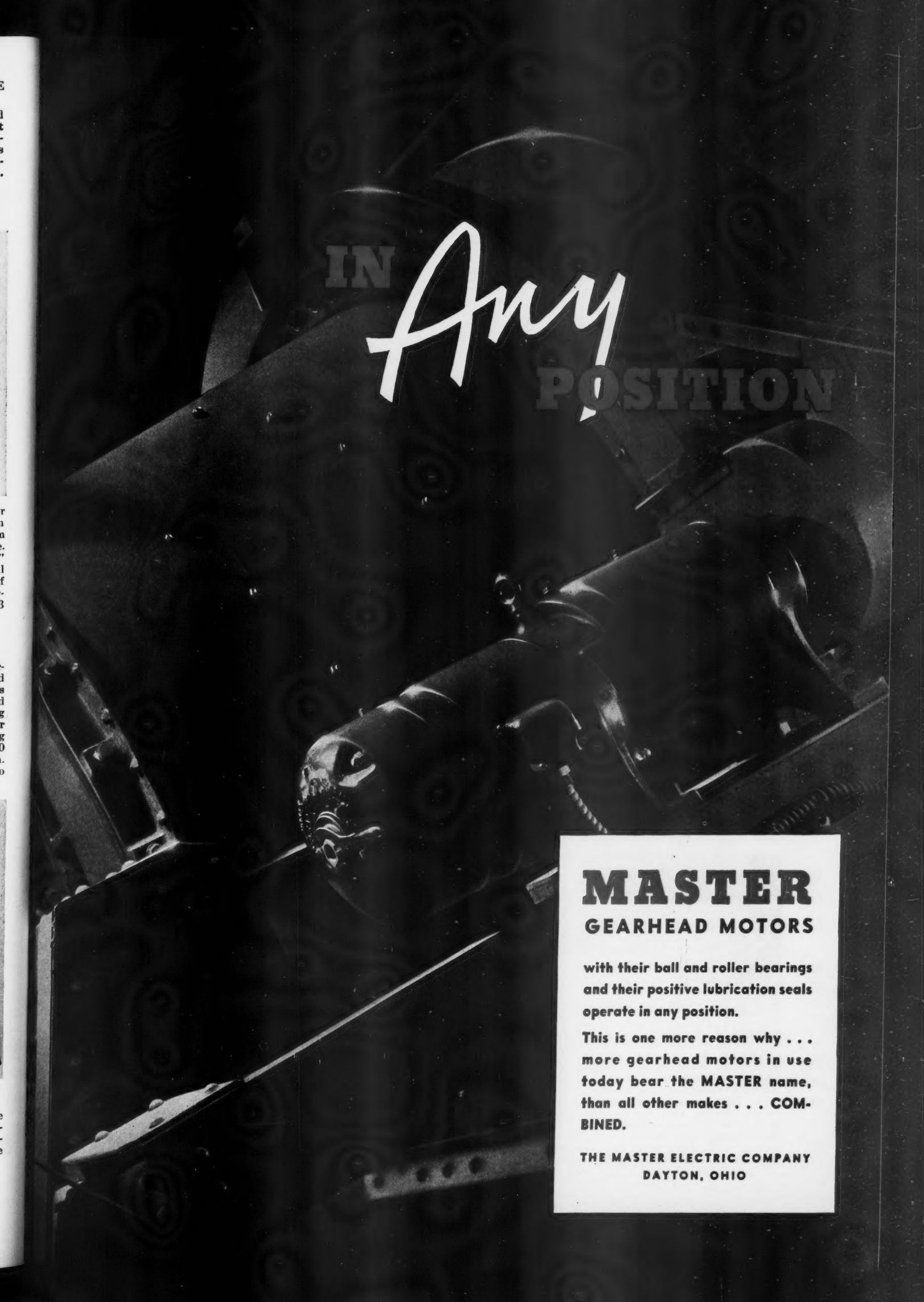
Drillpress

Radial bench drillpress has drill capacity of ½ in. Column height is 38 in., and the base is 36 in. long. Drill table is 10x15 in., and can be swung around and tilted at any angle. Arm can be swung around so that work can be done over side of bench. Has ⅓-hp., ball bearing motor and range of eight speeds from 200 to 3,000 r.p.m. Spindle travel is 6¼ in. Munding Mfg. Co., 703 East Colorado Blvd., Glendale, Calif.



Exhaust Fan

"Norblo" texrope-driven fan can handle sawdust, shavings, refuse from buffing, polishing, and grinding wheels, where the machines are piped directly to the fan and the

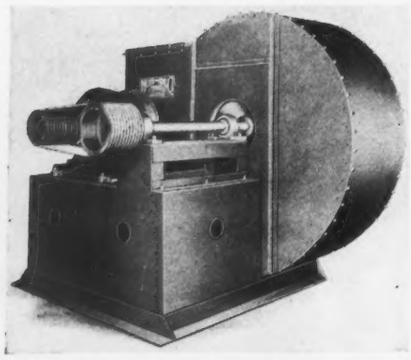


MASTER
GEARHEAD MOTORS

with their ball and roller bearings and their positive lubrication seals operate in any position.

This is one more reason why . . . more gearhead motors in use today bear the MASTER name, than all other makes . . . COMBINED.

THE MASTER ELECTRIC COMPANY
DAYTON, OHIO



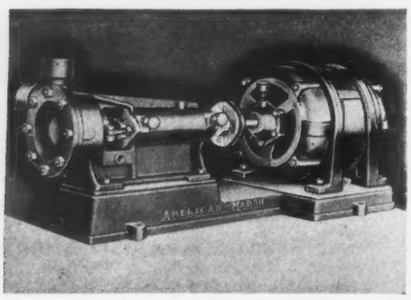
fan blows into a cyclone collector. Wheels are statically and dynamically balanced. All shafting is high carbon steel. Self-aligning ball bearing pillow blocks are used. On some of the larger fans, roller bearings will be furnished or the fans can be equipped with babbitted sleeve bearings. Fan housing and the motor base are made up of steel plates reinforced with angle iron, the motor base being bolted to the housing. The Northern Blower Co., 6409 Barberton Ave., Cleveland.

Skylights

"Thermag Semi-Vacuum Skylights" are designed to keep heat transfer through the skylight at a very low point. Solar radiation is retarded. Are constructed of special glass units supported by an insulated reinforced concrete grid. The concrete is used as a supporting structure because its heat transfer is less than that of metal. The joints between units have a zone of thermal insulation. Have light-diffusing design embossed on the inner surfaces and both outer surfaces are smooth and easily cleaned. Sunlight diffusion distributes light of even intensities over wide areas and eliminates objectionable concentrations of bright light and shadows. J. Merrill Richards, 110 West First St., Boston.

Pump

Type V turbine pump has only one moving part, the impeller. It is a centrifugal pump which will handle any non-viscous liquid free from abrasive matter. When direct-connected to an electric motor or other prime mover of sufficient power to handle the maximum pressure to be encountered on a particular job, these pumps cannot overload the driver should the pressure be less than estimated. Operates on suction lifts up to 28 ft. Designed for speeds up to 3,500 r.p.m. Pump comprises two main assemblies: one consists of the casing and all other parts which come in contact with the liquid handled; the other made up of the parts required for the mechanical operation of the entire unit. Built-in single-stage construction for pressures up to 175 lb. and two-stage construction for higher pressures. All parts coming in contact with the liquid handled are made of bronze except the shaft which is of Monel metal. Casing is of cast iron. American Steam Pump Co., Battle Creek, Mich.

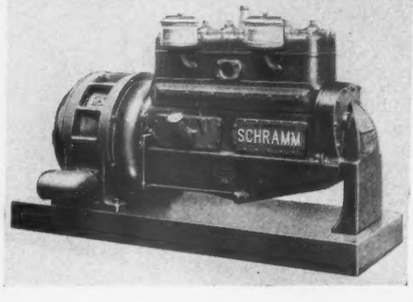


Strapping Tool

Model 3 direct-drive stretching tool is an improved tool for tensioning steel strapping around large and heavy packages. Has automatic gripper action which is controlled by the handle action. When tensioning operation is complete and joint made, drawing back the handle automatically releases the drawing and holding pawls, completely freeing the windlass and at the same time releasing the strap gripper. Has hardened gripper plate designed for long wear, reduced diameter of windlass shaft, and finer spacing of teeth on ratchet wheel. Long base, which rests on package, prevents tilting of the tool in tensioning. Signode Steel Strapping Co., 2600 North Western Ave., Chicago.

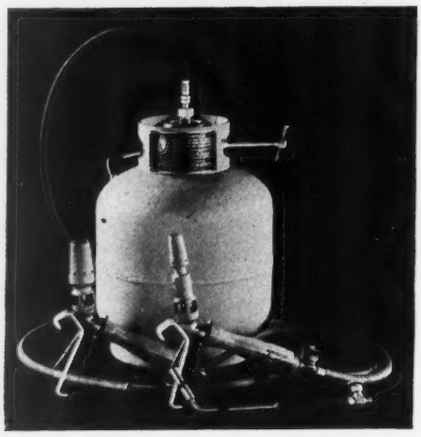
Compressor

Line of "Utility" air compressors features smaller, lighter parts. Has new type of mechanical intake valve located in compressor block and operated from camshaft. Force-feed lubrication. Vertical, straight-line, cylinder-in-line construction with water ports surrounding the entire cylinder area. Offered for either V-belt drive or for direct coupling with electric motor. Direct-coupled type utilizes motors of 1,200 r.p.m. class. V-belt types utilize motors of 1,800 r.p.m. class. Sizes are 85, 105, 160, 210, 315, and 420 cu.ft. air delivery per minute. Horsepower capacities range from 20 to 100 motor hp. Schramm, Inc., West Chester, Pa.

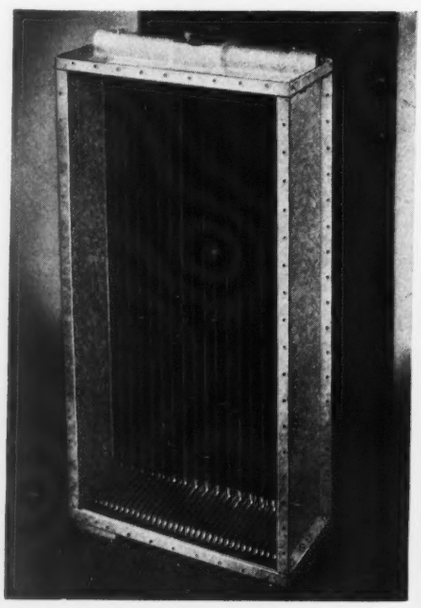


Torches and Furnaces

"Insto-Gas Torch" and "Insto-Gas Furnace" consist of furnaces and several sizes of torches fueled by liquified petroleum gas. The fuel is stored in small portable cylinders to which the various equipment may be attached. Advantages claimed for the torch are: provides instant heat, is safe, flexible, and simple. The equipment is sold outright but the cylinders containing the fuel are leased. The flame is sootless and the torches are light and will handle fittings from ⅝ to 6 in. The furnace provides portable heat for melting solder, babbitt, asphalt, etc. It lights easily under all conditions and will produce a heat that will melt 30 lb. of lead in six or seven minutes, it is claimed. The flame may be reduced to hold molten matter at any desired temperature. It does not smoke. Insto-Gas Corp., 1900 East Jefferson Ave., Detroit.



Heater



Blast heater for heating, ventilating, air conditioning, and process applications. Outstanding feature is elimination of expansion strain. The expansion bend allows each tube to expand and contract as its temperature requires without affecting the tube adjacent to it. Headers and tubes are cylindrical and seamless, and are brazed into a single rugged unit without use of gaskets, bolts, or screw joints. All steam-carrying passages are of copper or copper alloy from the point where the steam en-

OLD *RED-HOT*

Whether he goes into action as a rip-roaring bonfire or an invisible 200° F. *(or higher)* ambient, this symbolic sizzler is up to no good. His pet hobby is to burn or heat-rot wire insulation just for the fun of seeing you replace the wire when it fails . . . and then he goes back and does it all over again *if you let him.*

You can beat the old boy at his own game by giving him wire to work on that he can blast until he's red in the face *without injury to the insulation* . . . Rockbestos! It stops him cold because it's made of specially processed asbestos, and if you've ever used any you know that heat and fire don't bother it at all.

Rockbestos wires, cables and cords are made in more than fifty different standard constructions for heat-exposed installations. Our research laboratory can take care of special requirements. And, if you don't know what Rockbestos is, send for samples and a No. 10-D catalog. Rockbestos Products Corporation, 860 Nicoll Street, New Haven, Connecticut.

Also refer to Electrical World Buyer's Reference Number of Dec. 19, 1936. Part II.

ROCKBESTOS A.V.C.—*the wire with permanent insulation*

ters to where it leaves in the form of condensate. Steam distributing plate rations steam evenly to all tubes the full width of the condenser. It can be had in large variety of sizes and capacities. Modine Mfg. Co., Racine, Wis.

Paint Vehicle

"Hilume" is an oil-base vehicle for mixing with aluminum-bronze powder. It is applied by brushing or spraying. Said to adhere to iron and steel at any temperature to red heat. Hilo Varnish Corp., 42 Stewart Ave., Brooklyn, N. Y.

Timers

Line of Chronograph Wrist Timers showing time of day and indicating seconds, fifth seconds, and, if desired, decimals of a minute. One model has computations on dial which may be used for ascertaining production per hour. Timepiece has a 15-jewel movement. Cases are of stainless steel. Double lugs on either side of the crown allow for take-out-time for interrupted observations, without making it necessary to return the sweep hand to zero. When sweep hand is in motion, zero throwback lug is automatically locked, preventing an accidental return to zero. M. J. Stillman Co., Inc., 116 South Michigan Ave., Chicago.

Vapor-Proof Fixtures

Vapor-proof and dust-tight fixtures have two-piece canopy construction, permitting easy wiring and a reflector neck opening, suitably baffled, but large enough to permit the reflector to be taken down over the lamp without removing the front cover glasses. Two types are available, one for pendant suspension, the other for direct attachment to the 4-in. outlet box. Both have cast iron canopy top and a porcelain enameled steel canopy body with built-in aluminum baffle plate. Dust-tight joints are made between all threaded parts by means of woven asbestos gaskets. Front cover glass is equipped with a felt channel gasket. Reflector and body are acid-resisting, porcelain-enameled steel, green outside, white inside. Wheeler Reflector Co., 275 Congress St., Boston.

Rubber Pail

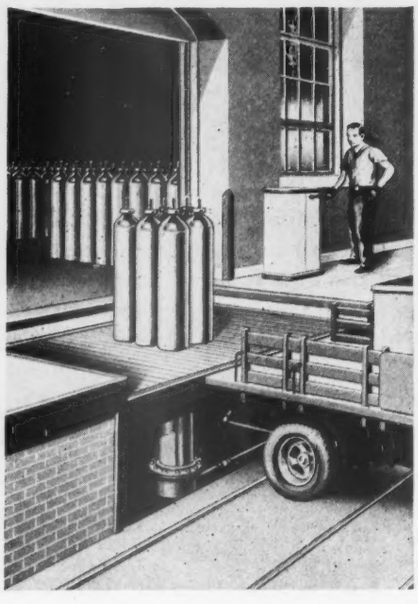
Acid-resistant rubber pail is unbreakable. Of seamless construction, it is made of latex compounded to give high tensile strength. Is reinforced by ribs so that it will hold its full quota of 12 qt. without noticeable bulging. Front side is reinforced with a 6-in. double thick wall permitting easy pouring when pail is resting on narrow edge. It is flexible and resilient and can be hit, banged, or stepped on without damage. It is 11 in. in diameter, 10 in. deep, and weighs 6½ lb. The Udylite Co., Detroit.

Ground Clamp

GF-13 Ground Clamp fits ¼- to ¾-in. pipe or conduit, as well as ½- to 1-in. diameter ground rods of any shape or material. Body is of cast copper alloy. There are no loose parts to handle. Direct contact between ground wire and rod. H. B. Sherman Mfg. Co., Battle Creek, Mich.

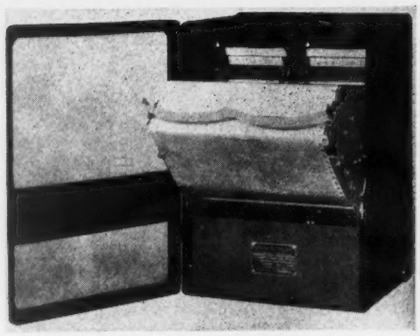
Elevating Tables

Short-rise elevating devices designed to eliminate existing ramps and hand feed of heavy materials to machines are an application of the hydraulic elevator principle. They are powered by oil electric pumping units, controlled either by hand lever at the pumping unit or by pushbuttons conveniently located. Called "Ramp Eliminator." When in its normal position it forms a part of the loading platform or floor, and ordinary traffic runs over it as it would over the rest of the floor area. Said to be economical to operate, safe and dependable, and rapid acting. Designed to handle loads from 500 through 28,000 lb. Rotary Lift Co., Memphis, Tenn.



Photoelectric Recorder

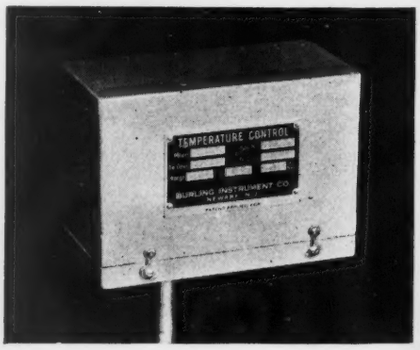
Will record simultaneously on one chart two electrical quantities as low as one microampere. With this double photoelectric recorder it is possible to record out-



door and indoor temperatures for air conditioning work, wet and dry bulb temperatures, and temperatures in heat-flow problems, General Electric Co., Schenectady, N. Y.

Temperature Control

Model HS-4 is a sensitive temperature control instrument that has no glass tubes to break or liquids to leak out. Temperature settings can be changed by means of an adjusting screw and dial. Provision



is made for locking any desired setting. It is suitable for temperatures up to 150 deg C.—300 deg. F. with an adjustable range of approximately 75 deg. C.—150 deg. F., depending upon the length of tube exposed to the changing temperature. Operates on 110 volts a.c. as standard, but relays with low-voltage control circuits can be furnished when specified. Furnished with tubes ½ in. outside diameter, 21¾ in. long as standard. When specified, instruments having tubes either 17¾ in. or 14 in. long can be supplied. Burling Instrument Co., 241 Springfield Ave., Newark, N. J.

Belt Guards

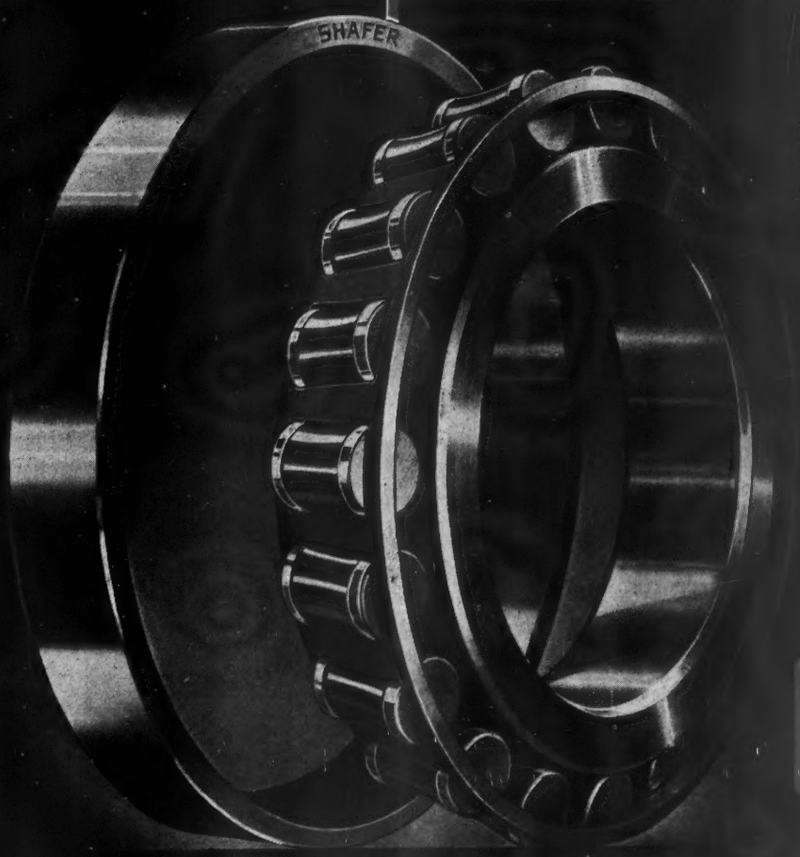
Safety belt guards are available for the company's No. 9 or No. 10 series lathes with self-contained countershaft. Both

The difference

between Shafer roller bearings and other types is that the exclusive Shafer CONCAVE roller design provides: 1. rolling self-alignment (important in itself); *plus*, 2. generous capacity for radial, or thrust, or combined radial-thrust loads; *plus*, 3. simple adjustability. Only Shafer delivers all these features in the same bearing.

SHAFER BEARING CORPORATION
35 East Wacker Drive Chicago

AVAILABLE IN A FULL RANGE OF SIZES: PILLOW BLOCKS • FLANGE UNITS • TAKE-UP UNITS • HANGER BOXES • CARTRIDGE UNITS • DUPLEX UNITS • CONVEYOR ROLLS • RADIAL-THRUST ROLLER BEARINGS

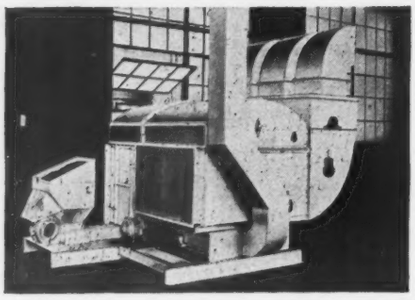


SHAFER

EVERYTHING YOU NEED IN A ROLLER BEARING

guards are aluminum castings with pin hinges for quick raising and speed changes. It is not necessary to remove guards to change belts. The left guard covers the motor-to-countershaft belt and has a special inner guard for the pulley on the countershaft. The right guard covers belt from countershaft to lathe spindle. Atlas Press Co., Kalamazoo, Mich.

Air Heater



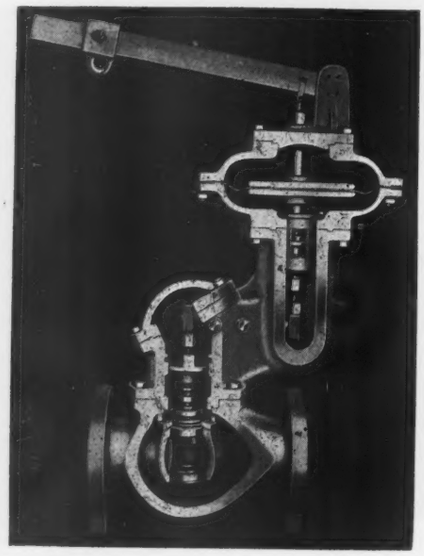
Automatic air heater for space heating burns coal, oil, or gas. Requires no foundations or boiler rooms, and can be set on the floor or mounted in roof trusses. Has thermostatic control. Is claimed to have high heating efficiency and low maintenance requirements. James Campbell Smith, Inc., 1671 Collamer Road, Cleveland.

Rubber Coating

"Rubberite" is a liquid material which protects inside surfaces of tanks against acids, and seals the seams. Is applied on steel or wood tanks by heating and then pouring and flowing it over the sides and bottom as each is placed in a horizontal position. Provides a rubber-like surface said not to crack or scale. Is said to be unaffected by most acids and caustics. Belke Mfg. Co., 947 North Cicero Ave., Chicago.

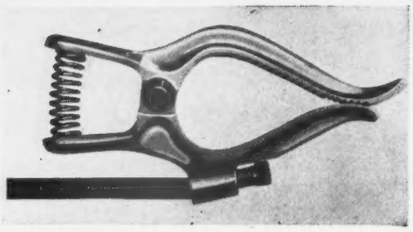
Gas Regulators

Line of gas regulators featuring an improved combination balanced valve unit. Has interchangeable parts, unit construction. Includes full range of lever-weighted, spring-loaded, and pilot models of both off-set and direct-connect types, either reducing- or back-pressure regulators. Standard sizes from 2 to 10 in. are available. The smallest orifice throat is 1¼ in. in diameter. All bodies are the same, for high- or low-pressure service. Designated as high-pressure type but change from high- to low-pressure service is easily made. Stabilizer eliminates surging and pulsation. The valve stem, valves, cage, etc. may be removed as a single unit. Stems are of stainless steel, with forged steel valve seats, bronze guides, and cast iron cage. Any of the high-pressure regulators can be equipped with 7-, 9-, or 11-in. diaphragm head. Reliance Regulator Corp. Div. of American Meter Co., 60 E. 42d St., New York.



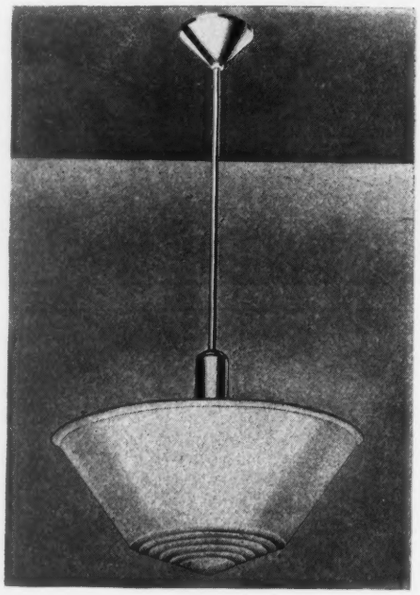
Ground Clamp

"Red Head" Ground Clamp is made of high copper alloy and has capacity up to 500 amp. Its jaw opening is 2½ in., and length overall, 10 in. Its spring tensioning member is completely insulated. Has positive mechanical cable connection; solder connection furnished if desired. Also new are mechanical cable lugs which have a tapered screw terminal working into a hollow corrugated body to give a positive connection. Body of lug is hexagon for ease of holding while installing. Come in hole and open types. Tweco Products Co., Wichita, Kan.



Drain Pipe Cleaner

Improved "Hydromatic" drain pipe cleaner has an air valve attachment to which compressed air lines can be fastened. This saves pumping by hand, the method by which the old models operated. This means the operator can fill a chamber easier and quicker and save time when repeated "shots" are necessary in order to clear an obstruction. Operates on hydraulic-pneumatic principle, shock and compressed air being directed against the column of water in the pipe. It is made of heavy seamless brass tubing with heavy brass castings at each end, and comes complete with 14 different accessories. Has air capacity up to 150 lb. per sq. in. Overall length is 1 ft. 7½ in.; diameter, 4 in. Weight, 9 lb. Parker S. Atwood, 6 Bradley Ave., East Haven, Conn.



Reflector

The "Commodore Luminaire" is available for use with lamps of 750, 1,000, and 1,500 watts. Aluminum hanger is used with 26½-in. diameter molded plastic reflector. This reflector weighs but 5 lb. and can be easily taken down for maintenance purposes with practically no possibility of breakage. The F. W. Wakefield Brass Co., Vermilion, Ohio.

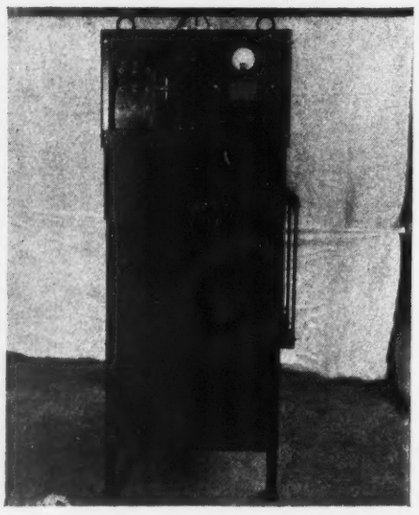
Change of Name

The Stein-Brill Corp., 183 Varick St., New York, has announced a change in corporate name to that of Brill Equipment Corp.

•

American Steam Pump Co., Battle Creek, Mich., has announced a change of name to that of American-Marsh Pumps, Inc.

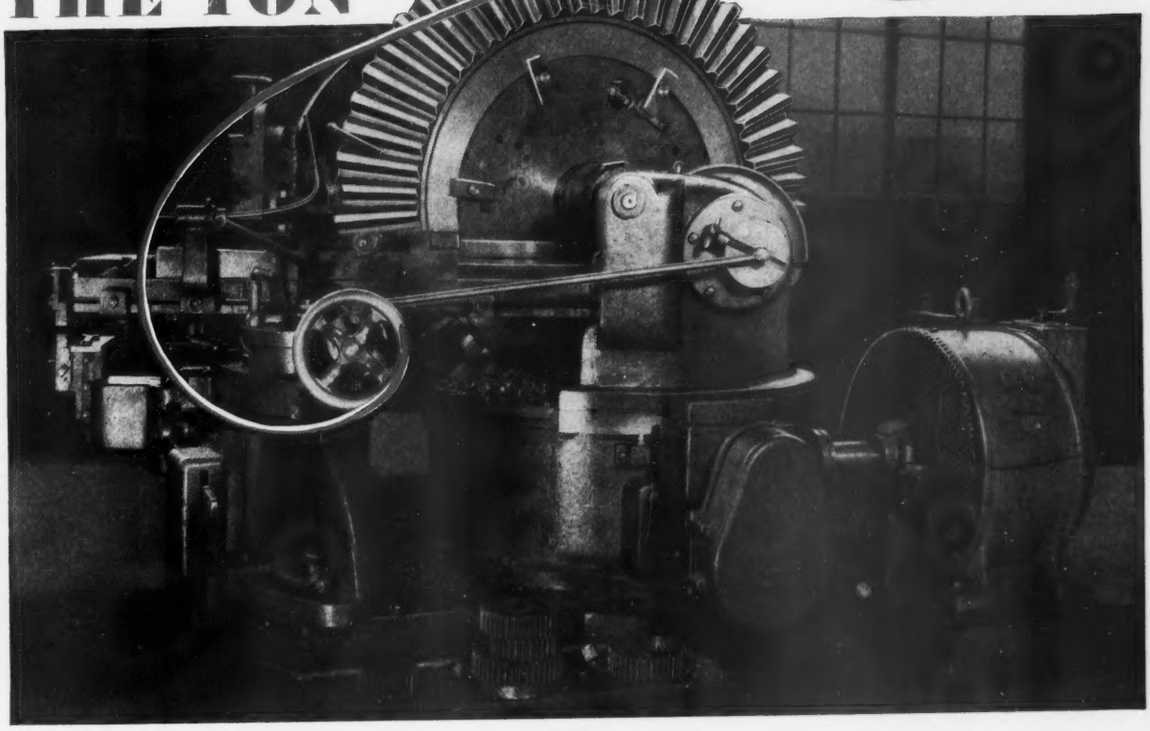
Rectifier



This rectifier supplies d.c. for electroplating from an a.c. source. Equipment includes power transformer, line switches, voltage control, copper oxide rectifier assembly, voltage selector caps, circuit breaker, and a motor-driven ventilating fan. All are mounted in a metal housing, on the side of which are busbar connections. Is furnished for a specified current input but

HAIR SPLITTING

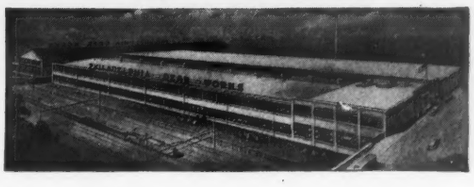
by THE TON



PERHAPS an odd expression—"hair splitting by the ton"—but in Phillie Gear's Shop it's actually an everyday occurrence. Big Gears containing hundreds of teeth—and each tooth exactly like every other tooth within thousandths of an inch. The metal throughout is so perfectly distributed and machined, that the gear (when placed on knife edges) will readily revolve by the slightest push of the hand. Yes, we repeat, "hair splitting by the ton". We've been doing it for years, and we can only do it because of our modern and versatile machinery, plus gear makers who are true craftsmen.

Gears and Speed Reducers: our business for nearly half a century.

PHILADELPHIA Gears MESH ACCURATELY



PHILADELPHIA GEAR WORKS

Industrial Gears and Speed Reducers

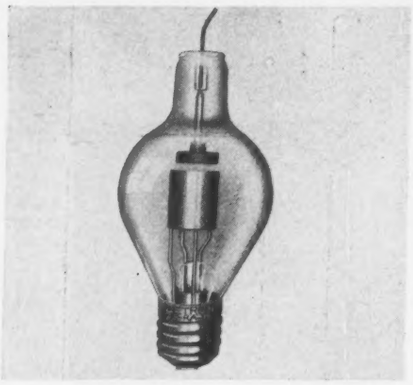
ERIE AVENUE & "G" STREET, PHILADELPHIA, PA.

is available in a range of sizes for different d.c. outputs. Transformer caps, protective and control devices, and a voltmeter are grouped together in an inclosure on one side. Hanson-Van Winkle-Munning Co., Matawan, N. J.

Asbestos Packing

"Prenite 20 M" compressed asbestos sheet packing is free from sulphur and is neoprene bonded. It resists oil, Freon, methyl chloride, and sulphur dioxide. Comes in 50 x 50-in. sheets in 1/64, 1/32 and 1/16-in. thickness. The B. F. Goodrich Co., Akron, Ohio.

Rectifier Tube

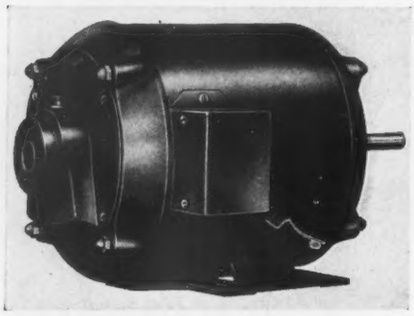


Type 2-RA-15 mercury vapor rectifier tube. Rated: filament voltage, 2.5; filament current, 16 amp.; average d.c. output, 15 amp.; arc drop, 5-8 volts; d.c. output voltage, 60 maximum; filament heating time, 2 to 3 min. Overall length is 8½ in., and overall diameter 3¾ in. Is designed for low-voltage applications, such as projector arcs, arc welders and the like. Manufacturer guarantees 2,000 hours life when used within specified limits. Continental Electric Co., Geneva, Ill.

Paint Compound

"Alasticflint Compound" is a combination thinner and binder for use in red lead metal primers, aluminum paints, and enamels. By itself it can be used as a varnish. It is waterproof and oilproof and acid-resisting. Used in aluminum paint, it helps keep aluminum powder in suspension. Elastic Compound Paint Co., Church Lane, Philadelphia.

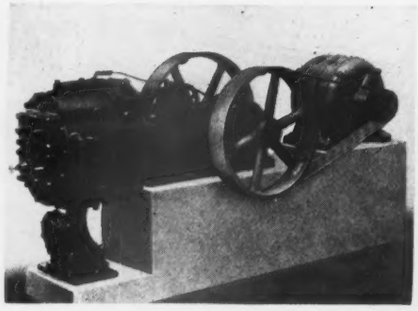
Motors



Line of fractional-horsepower motors in sizes from 1/6 to ¾ hp. Can be had in repulsion-start induction, single-phase, split-phase, capacitor, polyphase and d.c. types. Line is designed with interchangeable mounting dimensions for a given horsepower size. Century Electric Co., St. Louis, Mo.

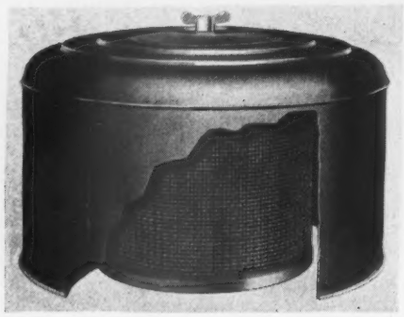
Vacuum Pumps

Improved line of single- and two-stage horizontal dry vacuum pumps. They are claimed to have high volumetric efficiency with minimum clearances maintained by design of the close-grained, semi-steel vacuum cylinders. Have special patented feather valve. Has double-row, tapered-roller-type main bearings mounted in as-



semblies, rigidly bolted to the side of the main frame and held in alignment by centering rings. Light-weight cast iron pistons. Built in eight sizes. Single-stage units can be had with piston displacements of 250 to 2,832 cu.ft. per minute. The two-stage units come in piston displacements of 138 to 1,425 cu.ft. per min. Single-stage units are employed for a vacuum of 28 in. or less, two-stage units when higher vacuum is desired. Worthington Pump & Machinery Corp., Harrison, N. J.

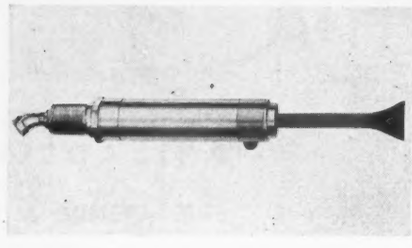
Air Filter



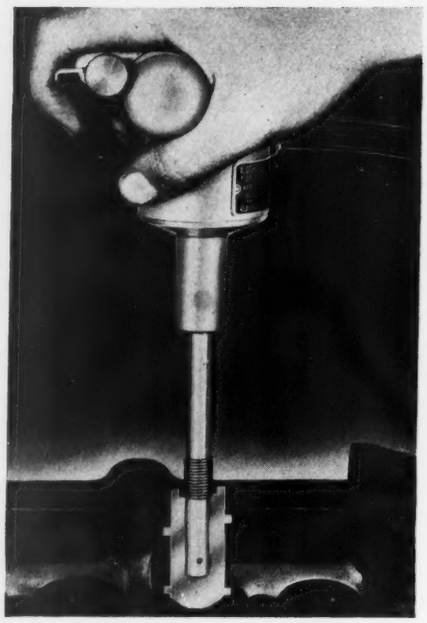
"Multimaze" air filter is an all-purpose unit. It is obtainable in various sizes for use on internal combustion engines, air compressors, blowers, and air-conditioning systems. Takes little space and is easily serviced. May be specially constructed to handle air cleaning problems where there are lint or other disturbing factors. Air-Maze Corp., 821 Huron Road, Cleveland.

Scaling Tool

Cleco B1 scaling tool is designed for general scaling work. Has graduated control valve located at rear end of the tool. Natural motion of the operator's hand automatically admits the right amount of compressed air to do the work most effectively. Slight pressure admits sufficient air if the work is light. If cut is heavier, there is naturally more hand pressure and consequently more power to do the work. This keeps air consumption to a minimum. Exhaust from the tool is directed to blow off chips and scale. Chisel retainer releases by flick of the operator's thumb. Chuck is square. Chisel blanks are made from ¼-in. square tool steel. Weighs about 3 lb., 6 oz., is approximately 11 in. long. Has bore of 1 in. and stroke of 1⅛ in. The Cleveland Pneumatic Tool Co., 3734 East 78th St., Cleveland.



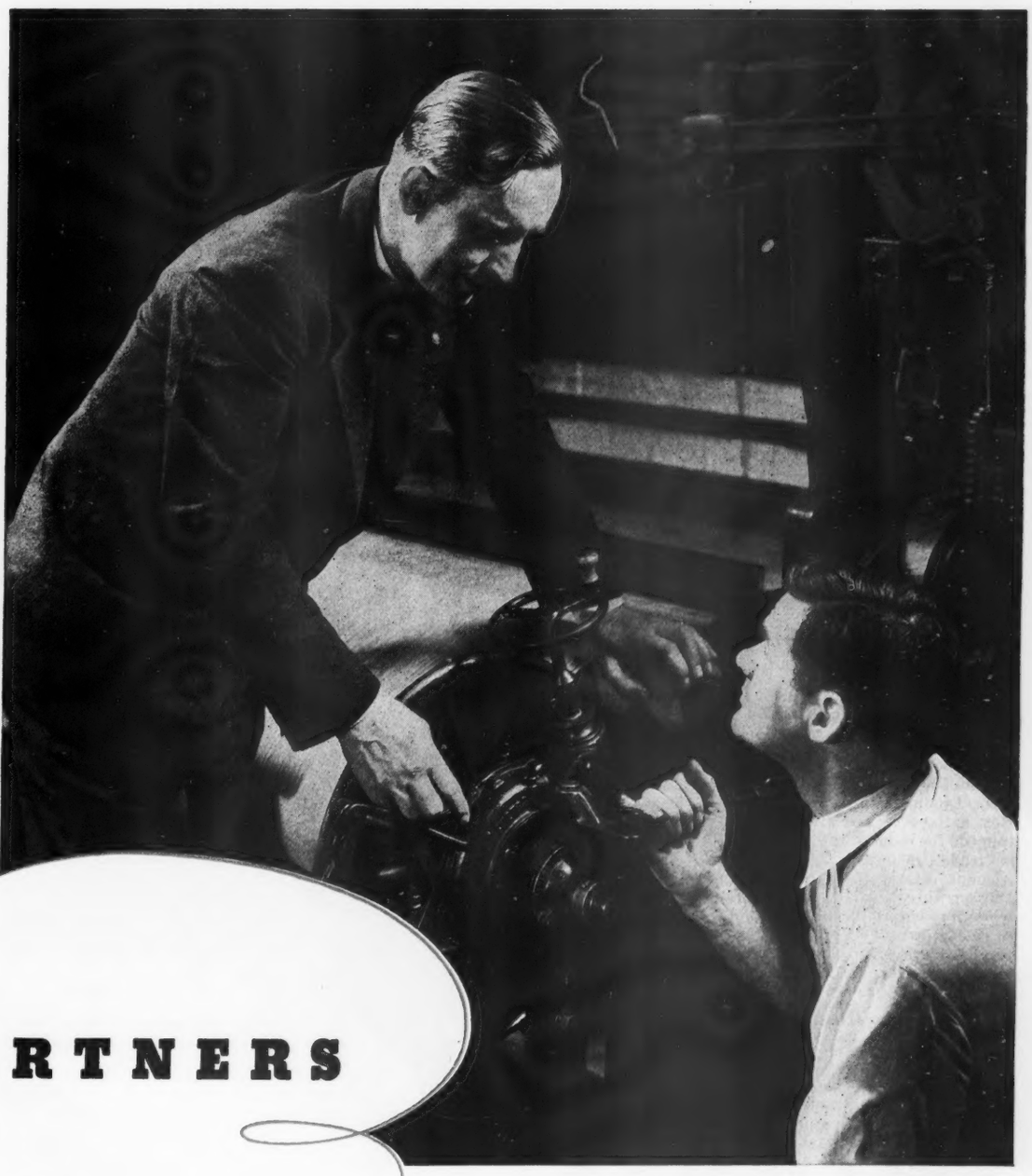
Valve Grinder



Pneumatic valve grinder originally designed for use in grinding valves on internal combustion engines, can also be used to lap plug and poppet valves of all types. The valve is rapidly oscillated back and forth and automatically moves forward ⅛ revolution per stroke. Grinding can be adjusted for speeds from 600 to 6,000 strokes per minute. It is said to be impossible to ring valves with this tool. There is a comfortable grip with trigger finger control. Aldon Products Co., Duncannon, Pa.

Telephone

The "Autodial" is a telephone which dials its own numbers. The dialing device is arranged, when installed, to provide a selection of telephone numbers as desired by the telephone subscriber, and any one of these numbers may be transmitted by merely setting the pointer opposite the desired name and depressing the lever. The machine then automatically transmits the digits of the proper number. This device does not replace the dial



PARTNERS

HERE is a familiar scene in American industrial plants today—the Gulf lubrication engineer working in cooperation with a plant man who is responsible for production.

Both have a definite objective: To get the most efficient lubrication possible for every bearing, gear and moving part in the plant. So they "team up," pool their knowledge and experience in a united effort to defeat friction.

The Gulf engineer is well fitted to carry on this cooperative work. His entire time is spent in gaining and applying knowledge of oils and greases—to the end that machines may operate more efficiently and economically. He works with the plant operator, recommending the use of lubricants exactly suited to each moving part and suggesting the best methods of application.

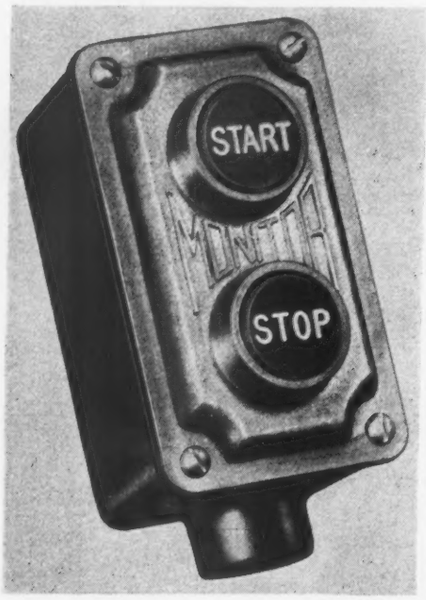
Such careful attention to lubrication pays a generous reward in lowered costs for maintenance, and for power. And, better still, the results are further reflected in improved production from all plant machinery.

The Gulf line includes more than 400 quality oils and greases. The combination of this quality line of lubricants and Gulf's engineering counsel can help *you* attain maximum efficiency for every machine in *your* plant.

GULF INDUSTRIAL LUBRICATION

which is still required for calls to stations not provided for on the Autodial mechanism. Nor does it affect dial operation. Comes in 12- and 52-station models. Automatic Electric Co., 1033 West Van Buren St., Chicago.

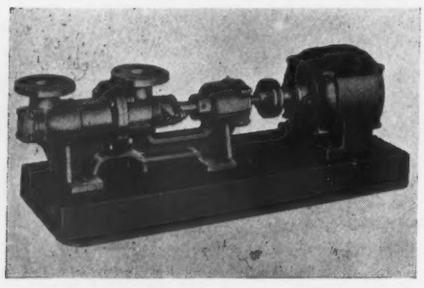
Pushbutton Control



Pushbutton control station is substantially built with liberal size pure silver contacts, mounted on a molded plastic base. Box and cover are die cast. The box is tapped for conduit entrance, and wiring is made by simply removing the cover without disturbing conduit connections. Buttons are colored, molded plastic. A wide number of contact arrangements is available with button markings suitable for most every purpose. Monitor Controller Co., Baltimore.

Pump

Moineau Pump is a valveless, positive displacement pump with a single rotating assembly. It is self-priming and will operate under high head pressures. It has uniformity of flow and will pump solids in suspension. It is said that it can pump any liquid that will flow in pipes, provided precautions are taken to insure ma-



terials of working parts in contact with liquid are inert to its chemical action, and that the liquid will act as a lubricant and cooling medium to the rolling friction of the rotor in contact with the stator. Robbins & Myers, Inc., Springfield, Ohio.

Motor

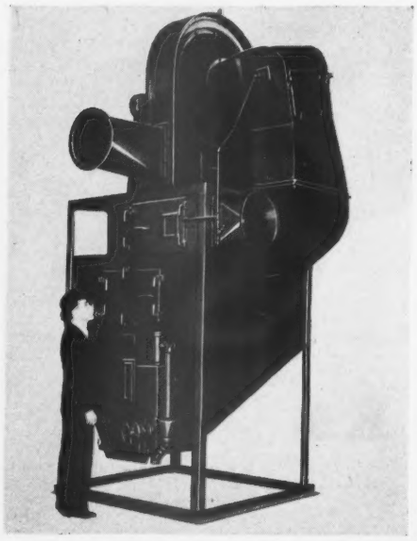
"Disc-brake" motor is a single unit combining functions of a motor with those of a brake. With it, it is often possible to connect drive direct and thus avoid need for clutches. Furnished in both a.c. and d.c. Brake consists of disc-type friction device, mechanically and automatically engaged when current is shut off, and magnetically disengaged when current is applied. A "wear-indicator," combined with the manual brake release mechanism, gives warning when wear needs to be taken up. Varying braking power, from maximum to 50 per cent of maximum, may be obtained. Reliance Electric & Engineering Co., 1088 Ivanhoe Rd., Cleveland.

Truck Casters

New line of silent steel truck casters is fabricated by projection welding. Caster assembly is made up in three parts, the top plate and king pin being one unit. Large-diameter ball race. Parts are of heavy-gage wrought steel. Made in 3-, 4-, 5-, 6-, and 8-in.-diameter wheels with stationary casters to match. The Bassick Co., Bridgeport, Conn.

Dust Collector

Type W Roto-Clone is a dust collector in which the wetting effect of water is combined with the dynamic principle of dust separation. It combines exhauster and dust collector in a single compact unit. The wetting of the dust particles with the water spray and their impingement on the



wetted surfaces of the impeller makes it possible to separate and collect a wider range of particle sizes. The flowing film of water on all metal parts eliminates wear from abrasive dusts. A constant air volume is exhausted at all times and no maintenance is required other than the periodic removal of the collected material. Collected dust is discharged in the form of a light sludge into a settling tank. A sludge ejector can be furnished to remove sludge continuously, making the operation entirely automatic. Made in nine sizes with capacities from 700 to 30,000 cu.ft. per min. American Air Filter Co., Inc., Louisville, Ky.

Speed Regulator

The 3700 Class governor is an oil relay unit designed for use with prime movers operating in service where accurate speed regulation is desirable. The construction of the governor is such as to cause the prime mover to run at constant speed at any load within its capacity. Changes in load cause a small and but momentary change of speed, which, by means of a pressure-actuated system or dashpot, is self-correcting, the governor automatically shifting the throttle to the position required to maintain speed under the new load conditions. The Pickering Governor Co., Portland, Conn.

Spray Gun

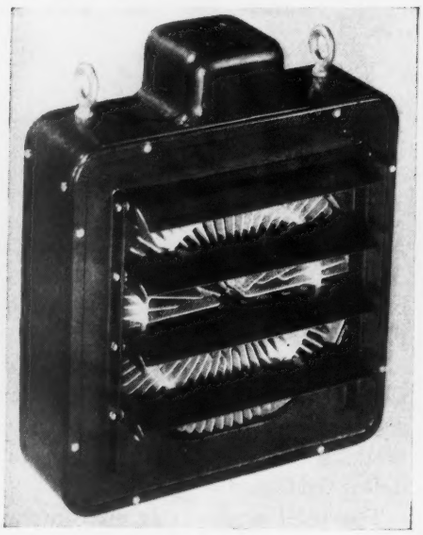
No. 20 gun is a paint spray gun having independently adjustable air and fluid ports. Has spray width control and a built-in air regulator. Spray head is self-centering. Comes in different designs for use with suction feed cup, for use with pressure paint containers, and for use with hose connections to both fluid and air. Crown Spray Gun Co., 1216 Venice Blvd., Los Angeles.

Colloidal Graphite

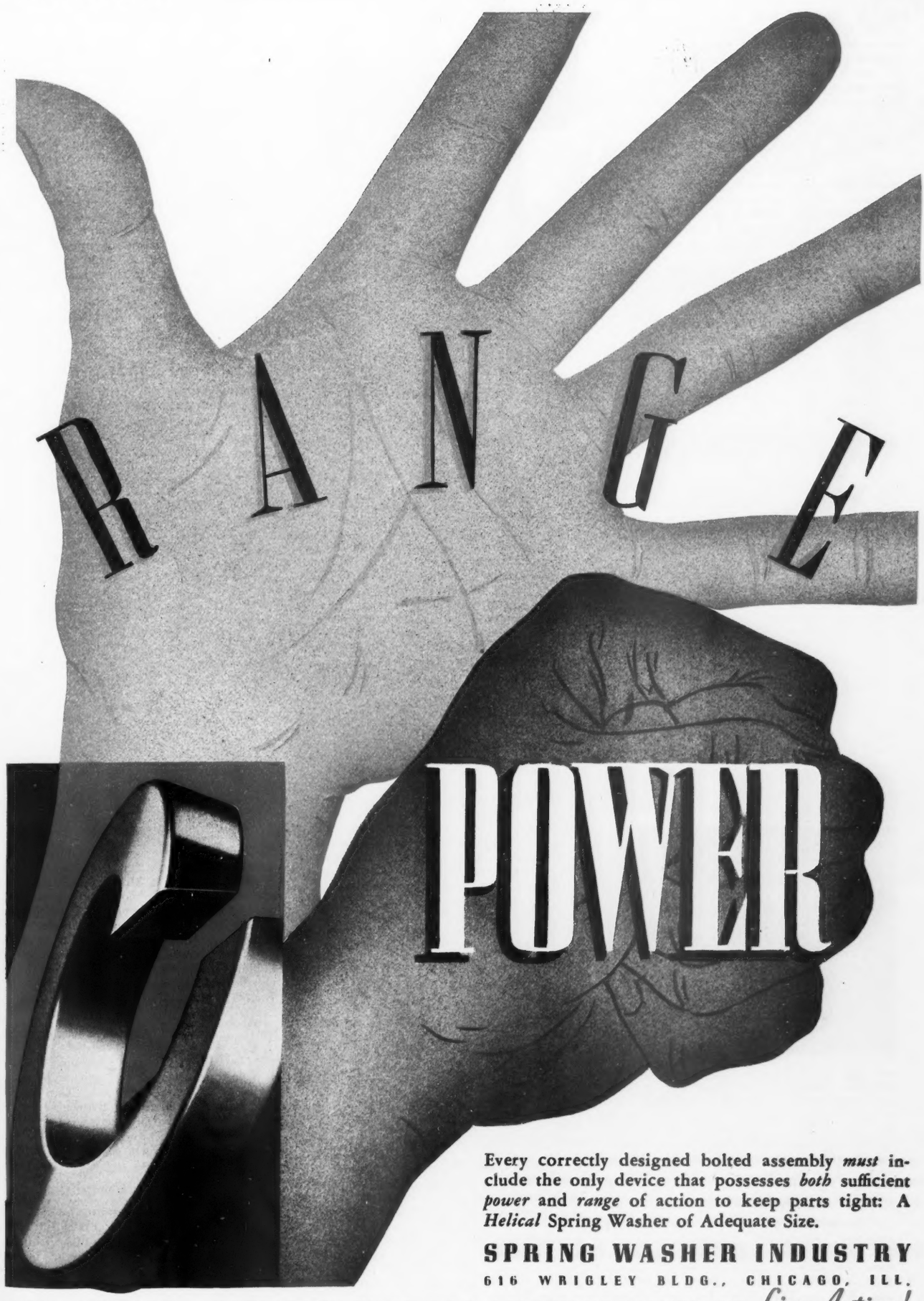
Graphite diffused in distilled water can be used as lubricant for cylinders, foundry parting compound, lubricating dies in drawing metals, base for electroplating nonconductors. Called "Aquagraf." Grafo Lubricants Corp., Sharon, Pa.

Heater

Model IBN Electromode Industrial Heater has a heat source which consists of a cast aluminum grid poured around a calrod heating element. A motor-driven, four-bladed aluminum fan, running on a graphite-impregnated bronze bushing for



quiet operation, dissipates heat from the entire surface of the circular grid and circulates the warm air. Heat can be directed wherever it is needed by moving a series of adjustable deflectors mounted on the front of the unit. It is equipped with "on" and "off" switch and provided with a thermal safety switch to prevent



Every correctly designed bolted assembly *must* include the only device that possesses *both* sufficient *power* and *range* of action to keep parts tight: A *Helical* Spring Washer of Adequate Size.

SPRING WASHER INDUSTRY

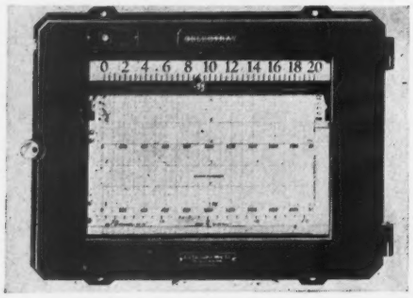
616 WRIGLEY BLDG., CHICAGO, ILL.

ONLY A HELICAL SPRING WASHER HAS ADEQUATE RANGE OF *Live Action!*

damage to the grid from overheating should the fan or air circulation stop for any reason. Obtainable with thermostatic control. Can be suspended frem ceiling by means of eyebolts or fastened to wall with angle braces. The American Foundry Equipment Co., 555 Byrkit St., Mishawaka, Ind.

Recorder

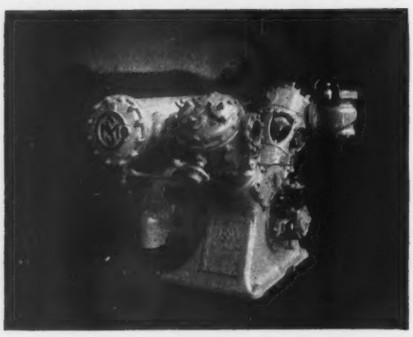
Recorder called the "Celectray" is a photoelectrically balanced potentiometer. A sensitive mirror galvanometer is the primary controlling element in which a beam of light takes the place of the customary pointer. The beam of light in moving on



and off a phototube passes the controlling edge of a screen, operating relays which in turn control a reversing motor which drives the moving contact of the potentiometer. The phototube is not a calibrated element but serves only to detect the direction of the light beam and bring the galvanometer to zero deflection. There is rapid balancing and control action and a high current sensitivity is available. The C. J. Tagliabue Mfg. Co., Park & Nostrand Aves., Brooklyn, N. Y.

Compressor

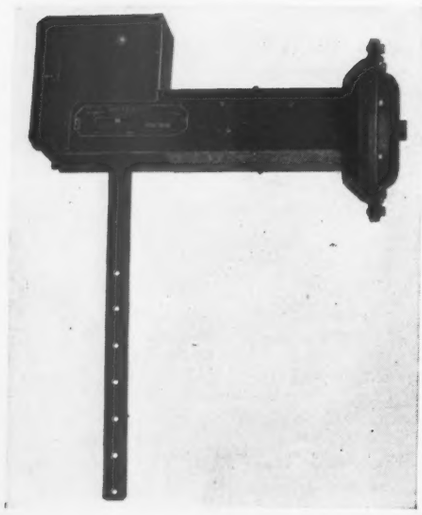
Class WN-112 air or gas compressor comes in displacement sizes of 378, 480, 642, and 800 cu. ft. per min. It is a continuous, heavy-duty machine which, while built for any type drive, operates most efficiently with built-in motor. Thus equipped it requires only a floor space of 6 x 8 ft. Vacuum pumps, boost-



ers for steam or gas and low- or high-pressure machines are available in this new type of construction. Equipped with "Dual-Cushion" valves. Is of V design and two-stage. It has double-acting cylinders and forced-feed lubrication. Sullivan Machinery Co., Michigan City, Ind.

Refractory

"Thermo-Stucco" can be sprayed or troweled over a fire clay surface. It can be used to face new linings, repair old ones, line furnace doors, seal cracks. Comes packed moist in a consistency for troweling. Chicago Fire Brick Co., 1461 North Elston Ave., Chicago.

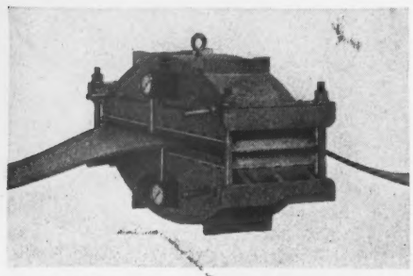


Lever Motor

"Motosteel Evenaction Lever Motor" is pneumatically operated and of all-steel welded construction. Deep diaphragm with large area gives smoothly modulated action. Lever is pivoted in phosphor-bronze bushings which are alignment-reamed in same manner as automobile engine bearings. A number of take-off holes are provided throughout the length of lever. Power of either up-stroke or down-stroke can be adjusted by spring-adjusting nut. Limit stops are provided for both up- and down-strokes. Base is drilled for mounting on floor, wall, or ceiling. May be operated by remote manual control, by electro-pneumatic switch, or by pneumatically operated controller. May be operated in parallel with diaphragm valve or other pneumatic equipment. Taylor Instrument Cos., Rochester, N. Y.

Belt Vulcanizer

No. 28 diagonal vulcanizer can be used for making splices in belting up to 28 in. in width. It is built to clamp across the belt in the diagonal direction of the ply steps in the splice. The platen of the vulcanizer is 11 in. wide and long enough to span a 16-in. belt with the steps cut at a 45-deg. angle, or a 28-in. belt cut at a 22½-deg. angle. Splices in belts up to 10 in. in width can be vulcanized in a single heat by clamping the belt lengthwise of the platens. Platens and supporting frames are made of aluminum. Each platen has automatic temperature control



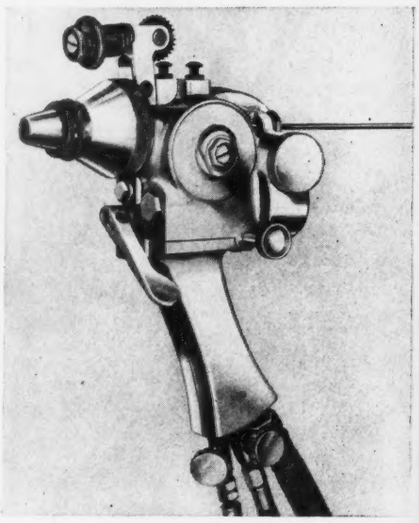
maintaining any desired temperature between 240 and 320 deg. F. Machine can be furnished for 110 and 220 volts, a.c., any frequency; universal for 110 and 220 volts, a.c.; universal for 110 volts a.c. or d.c.; universal for 220 volts a.c. or d.c.; universal for 110 or 220 volts in both a.c. and d.c. Current used is 28 amp. at 110 volts, or 14 amp. at 220 volts. James C. Heintz & Co., 3738-46 West 143rd St., Cleveland.

Lamps

"Spotlite" lamp is silvered on the inside, making lamp and reflector a single self-contained unit. It is a combination of concentrator and diffuser, the shape of the bulb and the position of the filament being such that light is thrown directly on the job while a diffused light is shed on the surrounding area. Concentrated beams are reflected from the parabolic curve in the upper globe while the others are reflected from the side walls. Available either with a standard base or with a special "Swivel Base" that permits the beam to be adjusted readily. As the swivel is an integral part of the lamp, no special sockets are required. It can be used for high bay and floor lighting, for throwing a light on moving assembly lines. Comes in wattages 100, 150, 200, 300, 400, and 500. Birdseye Electric Co., 100 East 42d St., New York.

Metal Spray Gun

"Universal" metal spray gun has a capacity for all metals and wire and rod forms from ⅛-in. diameter to No. 20 B & S gage. Melting range is from 400 to 4,800 deg. F. Power unit is separated from com-



bustion unit and wire feeding wheels are located outside of the gear case. Nozzle is one piece with a Monel metal tip. There are individual valve controls for acetylene, oxygen and air. All controls are one side of the gun, and hose connections are at bottom of handle. Connections are provided for mounting the gun on a toolholder for use on the machine, or the gun can be held in the hand. Metalspray Co., Inc., 113 Llewellyn St., Los Angeles.

Alloy

"Hastelloy B" is a nickel-molybdenum-iron alloy intended for use under conditions of extreme corrosion. Can be used in equipment handling hydrochloric acid. Is said to withstand action of sulphuric, phosphoric, and acetic acids. Haynes Stellite Co., 30 East 42d St., New York.

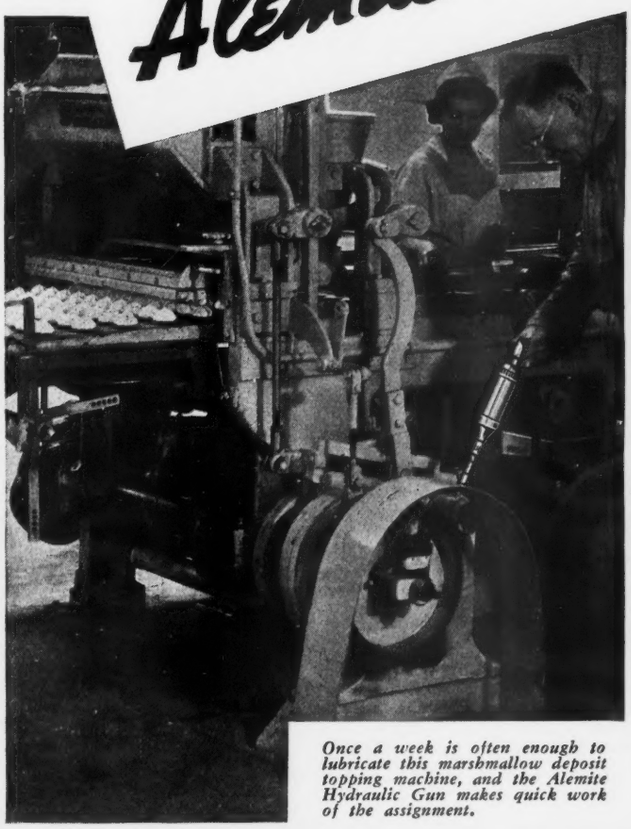
Flexible Coupling

Model S-2 flexible coupling has maximum bore of 2 in. Is rated at 12½ hp. at 100 r.p.m. Torque rating is 600 ft.-lb., and maximum r.p.m. 7,500. Overall diameter is 6½ in. Is of same rubber-cushioned design as other in the company's line of "S" couplings. Ajax Flexible Coupling Co., Westfield, N. Y.

"Clean!..."

PRODUCTS---MACHINES---BELTS---SINCE WE'RE USING

"Alemite Controlled Lubrication"



Once a week is often enough to lubricate this marshmallow deposit topping machine, and the Alemite Hydraulic Gun makes quick work of the assignment.

See how easy it is to apply Alemite to this big automatic enrober—capacity: 500 cookies a minute! Gun is quickly re-loaded with Alemite Filler Tank.

SEVEN million cookies a day is a lot of cookies! To produce that many requires a lot of modern machinery—and a lot of lubrication. But it must be *clean* lubrication—lubrication that keeps machines clean—products clean—belts free from oil-soaking that spells quick deterioration!

So . . . Salerno-Megowen Biscuit Company, of Chicago, uses Alemite Lubrication Equipment *and* Alemite Lubricants. Says J. R. Brandt, plant superintendent, "Machines that used to require daily oiling are now kept perfectly lubricated with a weekly application of Alemite 33. Our Alemite Hydraulic System puts the lubricant where it belongs—*in* the bearing—and keeps it out of foods, off machines, away from belts! And the Alemite Barrel-to-Bearing method, using the new Alemite Filler Tank to carry lubricant easily from drum to machine, is saving us plenty of time every week!"

There is an Alemite System, power or manually operated, to fit the individual requirements of your plant. Find out how easily it can be installed without interfering with production—and how much it can do to eliminate contamination, cut costs, and protect machines! Get the facts from our important new manual, "Alemite Controlled Lubrication." Mail the coupon today for your FREE copy.

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Enjoy Horace Heidt and his Alemite Brigadiers every Monday evening over Columbia Coast-to-Coast Network. See local papers for time of broadcast.

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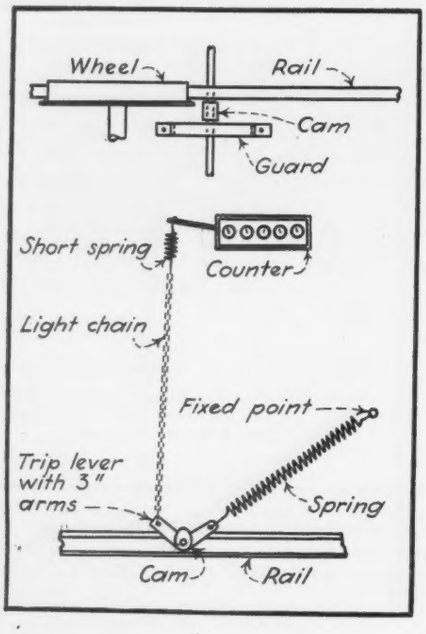
Operating Shorts

Car Counter Tallies Loaded Cars

K. B. HUMPHREY, *Sayreville, N. J.*

To count loaded cars running on a narrow-gage track, used in transporting materials about the plant, a counter was rigged up between the rails. Since a count was wanted of loaded cars only and empty cars were sometimes moved over the tracks in the opposite direction to the flow of full cars, this counter had to be a one-way recorder. As the counter was to be actuated by a cam which the wheels of the car pressed down as they passed over, provision had to be made against the possibility of a broken or worn wheel flange failing to depress the cam. What is more, cars were loaded on two parallel tracks and the tally had to be taken from both.

The last requirement was solved by running a shaft through the four rails and making one connection from it to the counter. These shafts passed through holes drilled in the rails and were supported by cast iron bearings. Motion of a car on either track actuated the counter, and since loaded cars moved along only one of the tracks at a time, there could be no skips from two cars passing over the cams at once.



A cam was located alongside of each rail to avoid misses in case a wheel flange was broken at the point where it would come in contact with the cam. If one wheel failed to depress a cam, the other wheel on the shaft was practically sure to actuate the cam on its side.

The sketch shows how the levers and cams were arranged so that cars going in one direction only would be counted. The trip lever was made in one piece and pinned to the shaft. A spring was fastened from one arm to a fixed point so that the cam would be held upright at all times, yet allowing it to be moved either way. From the other arm a chain was run to the counter, with a short spring inserted in the chain to protect the counter from too-quick pulls. When a cam (and therefore the trip lever) was depressed in one direction, it caused tension in the chain and a register on the counter; when in the other direction, slack in the chain and no register.

The counter was inclosed to keep out dust and prevent tampering. After several months' service the cams show little wear, and the only maintenance has been an occasional oiling of the bearings.

Mr. Humphrey's contribution has been awarded the $10.00 payment offered by the editors for the best Operating Short submitted during the past month.

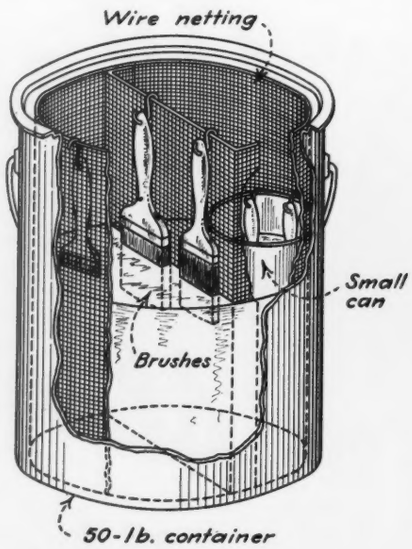
•

Keeping Paint Brushes in Condition

R. F. SHERFY, *Sunbury, Ohio*

Keeping paint brushes in condition when they are not in constant use is a problem. A 50-lb. lard can or similar container, with a tight-fitting cover, can be employed with good results, if a square mesh wire netting is bent around the inside circumference and across the center, and hooks are hung from this netting.

The hooks should be made of No. 12 galvanized wire and to convenient shape and size. Holes should be drilled through the brush handles in order to hang them from the hooks.



Turpentine or other preservative or solvent can be placed in the can to any depth desired. The level of the liquid is easily varied and, if necessary, the hooks can be raised or lowered in the netting.

When brushes used in different colored paints are to be stored, small cans may be sunk in the large container and each color stored in its own can.

Plants requiring frequent equipment rearrangement should have conveniently spaced plug-in points.

Re-using Cooling Water Reduces Summer Peak Demand

S. H. COLEMAN, *New York*

Many industrial plants have deep wells or other sources of cold ground water to supply process and other requirements. In such plants air conditioning equipment often is installed as an aid to processing, and to promote the comfort and efficiency of workers.

Where process requirements demand conditioned air of relatively high humidity, ground water frequently is cold enough and if available in sufficient quantities can be used for cooling and dehumidification in the conditioners. Obviously, due to the small temperature rise permissible in the conditioners, a heavy demand is thrown on the cold water supply in hot, humid weather. The limitations imposed by these peaks, although they are usually of short duration, are often a deciding factor against the use of ground water as a refrigerant.

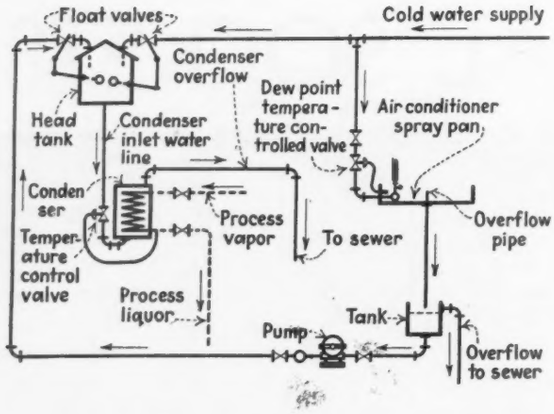
It is often possible to smooth out

ARROW INDUSTRIAL SOCKETS

—*with* Red Key and gray insulating enamel

These features set the Red Key sockets high above the ordinary. Threaded catch shells finished with *gray insulating enamel.* Gray porcelain interior, extended to form a bushing or bearing for the key (see insert view above). Brass shell cannot cut into the key stem. Heat-resisting lining encloses the porcelain interior. Furnished with usual female thread caps, also pendant and cord grip caps. Complete listings in catalog data-sheet, on request.

ARROW ELECTRIC DIVISION
THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD. CONN.



these peaks in water demand by re-using the air conditioner spray pan overflow in other sections of the plant, thus reducing the demand which they in turn impose on the source of cold water.

In one installation, illustrated in the sketch, the large quantity of relatively low temperature water from the conditioner spray pans is pumped to the head tanks of a number of process vapor condensers. The float valves in the head tanks are placed so that when the quantity of recirculated water is insufficient a slight drop in level admits cold water from the plant mains.

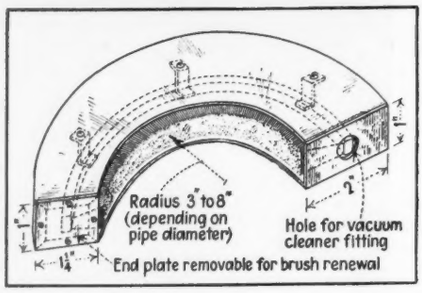
•

Two Scales Work on Quality Control

SOURCE, *Fairbanks, Morse & Company Chicago*

At its Radford, Va., plant the Lynchburg Foundry Company manufactures cast iron pipe by the deLavaud centrifugal process. Weights of various types of iron going into each cupola charge must be maintained exactly, if iron of uniform quality is to be obtained. To eliminate guess work an easily read dial scale weighs the component parts of each charge of scrap.

Immediately upon removal from the casting machines each pipe is weighed to see whether it contains the prescribed amount of metal. If the weight is not correct, word is passed back to the shop foreman and casting machine operators so that necessary changes can be made in machine speeds. This eliminates the scrapping of light-weight pipe and saves the cost of iron given away in over-weight pipe.



Special Notice

$15 will be paid for the best Operating Short submitted during the month of September. The Editors are the judges. Other Shorts accepted will be paid for at attractive rates

For chemical burns use plenty of water to dilute and wash away the damaging material.

Upside Down Bifocals

At the Corning Glass Works, Corning, N. Y., some employees wear spectacles with bifocal lenses. In some operations in glass working, it is necessary for the product being worked on to be held up on a level with or higher than the worker's head, and closely examined.

When that happens, the man with close-vision lenses at the bottom of his spectacle frame can't see the work unless he raises his head to an uncomfortable position.

Corning has provided such workers with bifocals having reversed lenses, that is, the close-vision lens is above and the distant-vision lens is below.

•

Vacuum-Cleaned Pipes

JOHN I. THOMPSON
Assistant Plant Engineer
Bristol-Myers Company, Hillside, N. J.

This pipe-cleaning tool for use with a vacuum cleaning system was made by cutting out two pieces of 16-gage or heavier sheet metal, bending them to a convenient radius, and welding them on a back of sheet metal about 1 in. wide. The whole assembly was then welded to a connection.

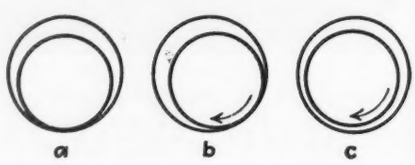
A metal-backed brush was then bent to conform to the radius of the sides, and was secured inside the opening halfway between each side, with the bristles allowed to project about one-half inch. Lugs soldered to the back of the brush were then fastened by means of bolts to one side of the tool so that the brush might be renewed.

Toolbox burdens can be reduced by drilling holes in heavy wrenches and other weighty tools at points where holes will not weaken the structure of the tools or interfere with their operation.

Lubrication Affects Position of Journal

JOHN W. POOLE
Consulting Lubrication Engineer
New York

Whether it is turning or at rest, the outside circumference of a shaft is rarely found to be concentric with the inside circumference of its bearing. This fact is of importance in machine design, and it is possible that in some instances it may be used for checking the quality of lubrication.



There are three types of displacement, each determined by motion, lubrication, or both. Regardless of

HOW Scott Paper Co. *Gets the Most Out Of* ELECTRIC INSTRUMENTS

WOODCUT DRAWING BY ZADIG

Under the direction of Mr. Sam Holderness

MR. Sam Holderness, electrical superintendent of the Scott Paper Company, Chester, Pa., is a fine example of an engineer who is instrument-minded. He employs more than 100 electric testing instruments, chiefly recorders, in every possible way.

How He Uses Them

Most recorders are installed on beaters, Jordans, head-box pumps, and paper machines. They give running records of processes, assist operators, anticipate troubles, and fix the blame for troubles when they do occur.

Indicating instruments, both permanently installed and portable, are also widely used, as are six portable recorders. Nearly all instruments are General Electric.

Near-perfect Operation

Patrol men read instruments regularly. One result: The total time lost on any equipment or process chargeable to the Electrical Maintenance Department, for the first quarter of 1936, was only two hours. For a plant so large, with so much electric equipment, and operating 24 hours a day, 7 days a week, this record is excellent.

Example of "How"

A recording ammeter showed that a generator was carrying more than normal load. This generator supplied power to the driving motors on a paper machine. Suspicion pointed to a pressure roll. But the roll looked all right.

Then started the real detective work. Orders were issued: Investigate the production records on the machines on which that roll had been used. Check the corresponding instrument records. These gave the answer: On every machine, excess load conditions had gradually built up whenever that roll was used. The roll *was* faulty. Out it went, and with it went the trouble.

This is just one example of how Scott Paper, by the use of instruments, catches trouble before it becomes serious, maintains the quality of its product, and keeps its plant running efficiently. Instruments have proved, over and over again, a most profitable investment.

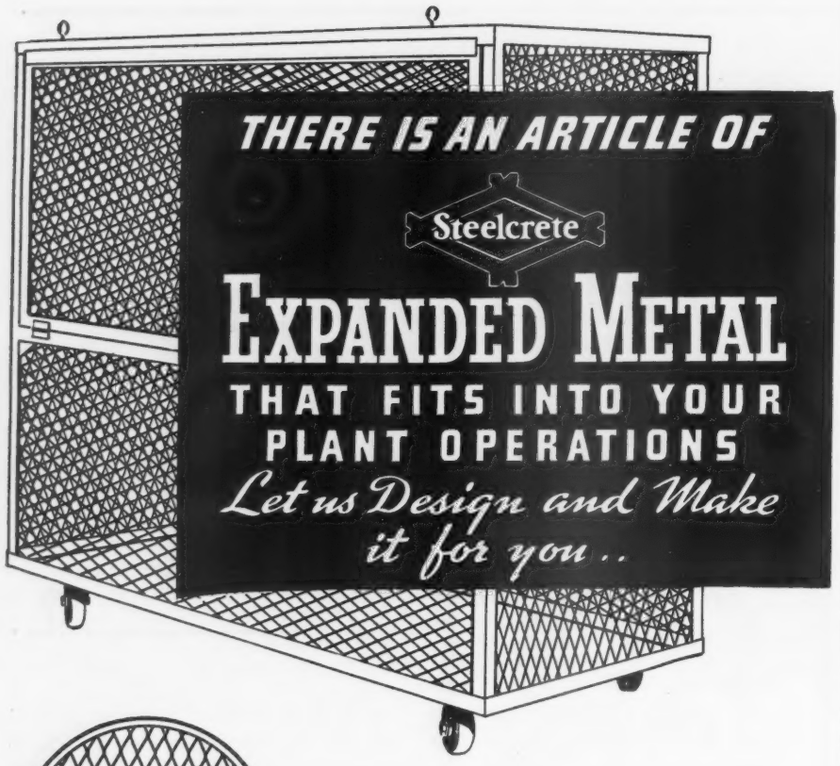
ASK YOUR ENGINEERS WHAT INSTRUMENTS CAN DO FOR YOU

To management, we suggest: Ask your engineers what electric instruments can do for you. Encourage them to make studies as to where instruments might point the way to savings, to improvements, and in the end to more profits. If there is any way in which a G-E instrument specialist can help, feel free to call on him at any time. Address nearest G-E sales office, or General Electric Company, Dept. 6— 201, Schenectady, New York.

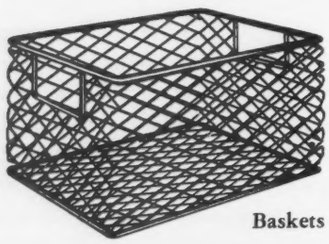
430-70

GENERAL ELECTRIC

HEADQUARTERS FOR ELECTRICAL MEASUREMENT



Ventilator Grilles



Baskets

Shelves

● Somewhere in your plant operations you can advantageously use an item made of Steelcrete Expanded Metal. It is part of our business to design and make these convenient items for you. This Steelcrete diamond mesh combines light weight with the strength of solid steel and it is fabricated in various gauges to meet all requirements from the lightest of trays to heavy duty shelving and partitions for complete factory enclosures. It is also supplied in flat finish, and it may be plated or baked. For food handling, the mesh is hot dipped in Straits tin. Ask for the Steelcrete Handbook—and put your special problems up to us for solution.

NEW . . . STEELCRETE FENCE

This company has applied expanded metal to protective Fence Construction and it is now available for industrial and property enclosures. Send for special catalog.

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lubrication, when a shaft is at rest it will take the position at *A* in the sketch, in which clearances are exaggerated.

If the shaft is rotating clockwise and either actually touches the bearing, or is separated from it by only a microscopic film of lubricant, it will be displaced to the right, as shown in diagram *B*. This is, of course, what one would normally expect. The distance of displacement will be determined by the equilibrium between "lifting" friction and gravity.

The actions mentioned above are well known, but the third condition may not be. In it, rotation is the same as before, but a definite film of lubricant positively separates the shaft and bearing. Under these conditions the displacement of the shaft is to the left, as diagram *C* shows.

Briefly, the explanation is: Under the conditions shown in *C* the effect of rotation is such that the pressure of the lubricant continuously increases in any annular space which converges in the direction of rotation. This increase in pressure will continue up to the narrowest point, but thereafter it decreases so fast that the pressure on the left falls far short of equalizing that on the right. This unbalanced force supports and displaces the shaft.

It has been assumed, of course, that the only loading is gravitational. Other forces will naturally have their individual effects.

Portable electric cords should be inspected frequently for poor insulation and mechanical injury.

Two Ways to Eliminate Disputes on Pay Shortages

CHARLES B. GORDY, *Detroit Editor*

Pay shortage disputes often occur over piecework. Two methods of eliminating this difficulty have been used in different industries.

A plant in the brass industry uses a Hollerith job ticket for each job worked. These tickets are purchased with a small card attached to the back of the Hollerith card. When a card is filled in at the completion of a job, a carbon placed between the cards records on both cards the number of pieces completed, the rate, and the worker's number. The small card is given to the workman and the Hollerith card goes into the pay-

BALANCE

Dynamic AS WELL AS *Static*

One expects transmission equipment to be statically balanced, but Allis-Chalmers has now made, commercially available, a Texrope Sheave with the finest Dynamic Balance, for applications that require complete lack of vibration at all speeds. Not all applications require this extreme precision, but Allis-Chalmers has made it available for those that do, and the engineering ability capable of producing the Allis-Chalmers Dynamically Balanced Texrope Sheave is inherent in all Texrope equipment. • Allis-Chalmers engineers conceived and developed the multiple V-Belt principle, the Duro-Brace Texrope Sheave, Vari-Pitch Texrope Sheave, and now offer a new high standard in Dynamically Balanced Sheaves for Texrope V-Belt Drives. If you want the finest and the most advanced multiple V-Belt transmission equipment, for every application, you want Allis-Chalmers Texrope Drives.

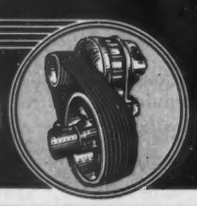
Write for Vari-Pitch Bulletin No. 1261

Belts by Goodrich

744

TEXROPE DIVISION

ALLIS·CHALMERS



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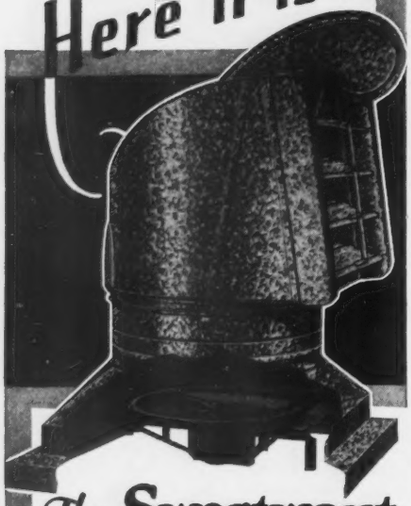
-Essential in Architecture
-Equally Essential in Power Roof Ventilators
Here it is!



The Swartwout AIRJECTOR

- Keeps the discharge opening always *facing away from the wind*—thus reducing wind resistance to the minimum.
- Has only one right angle turn for the discharged air to travel — and no baffle plates to set up resistance and retard capacity.
- Operates with equal efficiency in all weather and wind conditions.
- Actually *increases in substantial amount* the capacity secured from standard code rated fans.
- Operates on the Rotary Principle with fully enclosed dust-tight stainless steel non-lubricating ball bearings.

And when motor is not operating it still gives almost full gravity capacity — thus requiring minimum operating expense. Write for complete details today.

THE SWARTWOUT COMPANY
18509 Euclid Avenue
Cleveland, Ohio

Ventilation Specialists

roll department. In case of dispute at pay time, the worker is requested to produce his cards and the difficulty is easily adjusted.

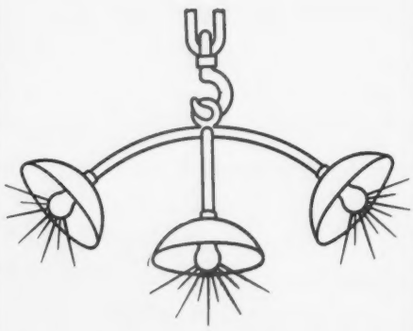
Under the second plan a card is used at each machine, and the machines, mostly presses, are provided with counters. The operator records his production each hour on these tickets. At the end of the day the payroll department collects the cards and by eleven o'clock the following morning has made out a ticket for each man, showing the jobs worked, the number of pieces, and the amount earned. Daywork is similarly recorded but on a different ticket. These tickets are placed on a board in the lunch room, the tickets for each workman being hung on a hook under his number.

•

Mobile Lighting for Shipping Room

GORDON W. RICHARDS, *Orange, N. J.*

Finding that it would cost quite a bit to light a huge shipping room at night, and inasmuch as men worked in only one section of it at a time,



one local plant devised a cluster of three lights with huge reflectors that could be hung from a traveling overhead crane which was seldom used. Thus the lights could be moved about with the workmen, and adequate lighting of 30 sq. ft. was supplied.

•

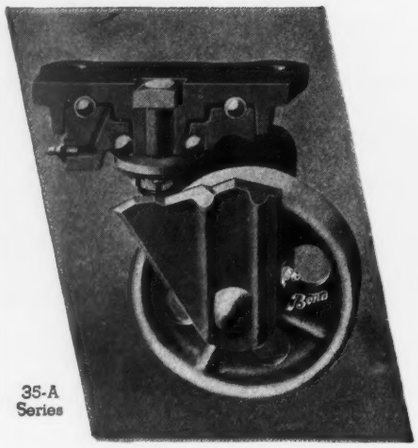
Fight Heat with Salt

A serious problem to many industries is the effect of extreme heat on employees. In mills and factories where high temperatures necessarily exist the problem of heat cramps and heat prostration is especially acute. Summer intensifies the problem.

The use of salt as a remedy and preventive measure in such cases has long been known. In profuse perspiration not only is a great amount of water lost through the sweat

Put your money on the RIGHT Caster

Pick the right horse and you win money. Pick the right caster and you save it.



35-A Series

Picking the right caster is a much easier trick than picking the right horse. The only "form sheet" you need is Bond Catalog K-25-B.

Listed in this handbook are casters for every type of trucking job. Whether you move boxes of millinery or heavy shafting, there's a Bond Caster specially designed for the job. Ask your Bond distributor — or send for the book that has helped hundreds to "pick 'em right" — Catalog K-25-B.

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MANHEIM, Lancaster County, PENNSYLVANIA
617 Arch St., Phila.; 30 Church St., N. Y. C.
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TRUCK CASTERS
Bond Power Transmitting Machinery delivers more power at less cost.

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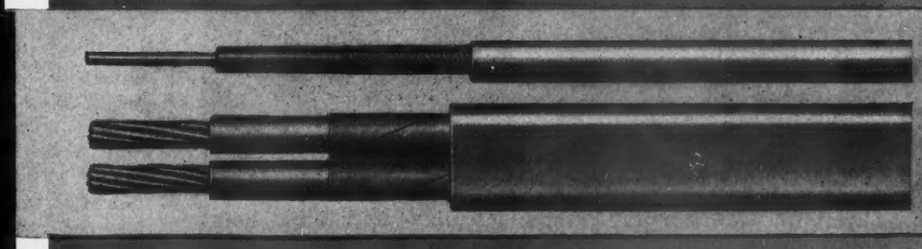
IT SAFEGUARDS PRODUCTION

The protected insulation of G-E Lead-sheathed Cable provides tough, enduring resistance to dampness, steam, fumes, dust and dirt, the destructive agents of wear and deterioration. This cable, with years of useful life, gives dependable, uninterrupted service—assures the continuous operation of plant equipment. Here is permanent wiring at its best—a safeguard against emergency wiring replacement, a staunch ally of production.

Refined copper conductors, protected by a tin coating, rubber insulation, covered by braid or tape, plus the lead sheath, make this cable practically indestructible. Available in single- and multiple-conductor construction.

Guard the electric service in your plant with G-E Lead-sheathed Cable. Give production enduring protection.

Get complete information from your nearest G-E Merchandise Distributor, or write to Section W-969, Appliance and Merchandise Department, General Electric Company, Bridgeport, Connecticut.



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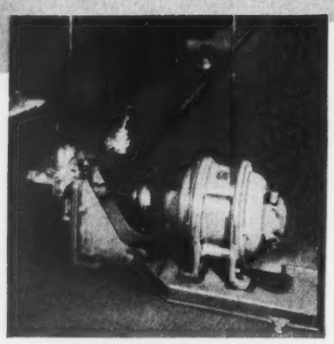

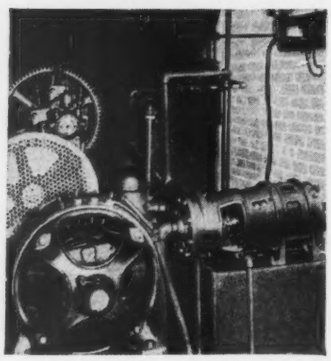

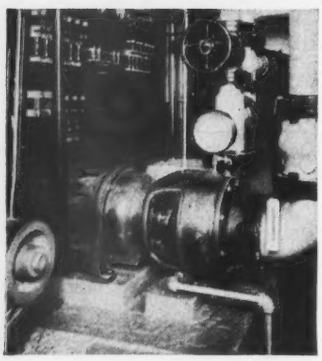

Goulds Centrifugal Pumps for low and high head operation with capacities from 10 to 15,000 G.P.M., piston pumps, condensate return units, sump pumps, rotary pumps, and diaphragm are available in sizes to pump water and other industrial liquids at any rate and pressure.

Ask your distributor or write for complete pump information.

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7704

glands, but a great deal of salt is lost from the body along with it. To replace this salt workers should use plenty of salt on their food and take salt tablets from time to time.

Several plants that have made salt tablets available to employees have eliminated cases of heat prostration. These tablets are usually placed near drinking fountains where they are swallowed whole and followed by one or more glasses of water.

Salt tablets are available in most communities and may be purchased in bottles which fit handy dispensers.

Make periodic inspection of goggles to make sure that they are in good condition.

No Light Flicker If Motor Has Flywheel

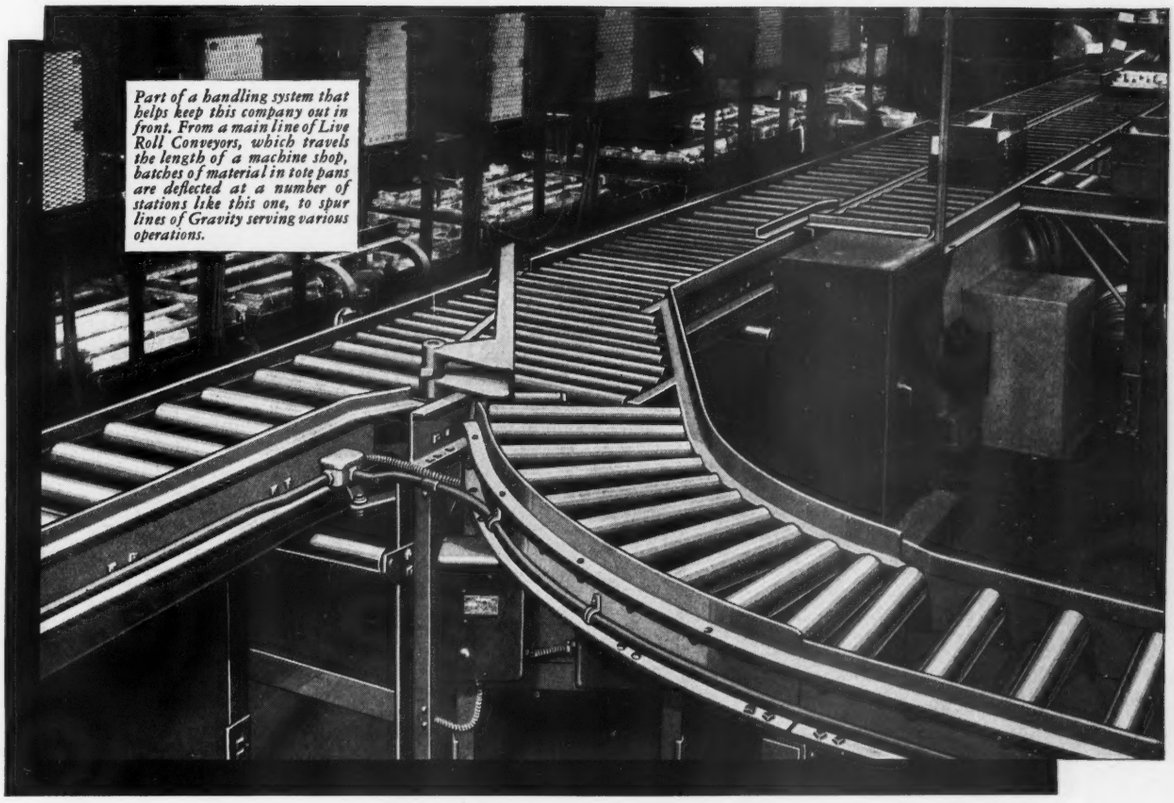
J. S. BAUGHMAN, *Industrial Division Westinghouse Electric & Mfg. Company East Pittsburgh, Pa.*

Pulsating loads of reciprocating compressors have a direct effect on the speed of synchronous motors. While a synchronous motor is inherently a constant-speed motor, the speed at any particular instant may differ from that at another instant.

This variation is, however, one of space rather than of time. As the load increases the rotor tends to slow down, and the distance by which it lags behind the point where it would have been if it had maintained constant speed may be called the load angle, or the angle by which the rotor poles lag the stator poles in space. As the load increases further, this load angle increases until a certain maximum is reached. When this maximum angle is exceeded the motor loses synchronism and pulls out of step. Therefore, this maximum angle is called the pull-out angle. Similarly, as the load decreases the load angle decreases, so that at no load, and neglecting losses, it is zero.

When a synchronous motor is directly connected to a compressor, the load angle of the motor will follow closely the compressor load to a maximum. and then start to decrease. When the piston reverses after the compression stroke ,the load drops to a minimum, and the load angle follows. To do this the rotor must momentarily accelerate, so that for a moment the field is actually revolving faster than the stator poles.

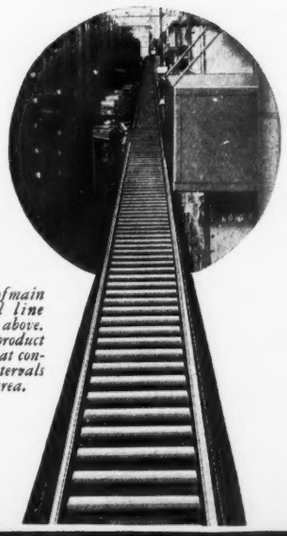
Due to the inertia of the rotor, it



Part of a handling system that helps keep this company out in front. From a main line of Live Roll Conveyors, which travels the length of a machine shop, batches of material in tote pans are deflected at a number of stations like this one, to spur lines of Gravity serving various operations.

GETTING THERE ★ ★ ★

ahead of competition



Final unit of main Live Roll line illustrated above. Finished product is deflected at convenient intervals to storage area.

"STAYING out in front" of competition is becoming more and more a matter of diagnosing trends in *cost-cutting production equipment*—putting into practice developments for saving Time, Effort and Space as soon as they become obviously worthwhile. . . . In short, keeping ahead is thinking ahead of your competitor. Is your plant as "conveyorized" as it should be for efficient, economical operation? Right now, in 1937-38, no field holds more money-saving possibilities than that of materials handling. To get the edge on competition, now is the time to act. . . . The nearest Logan engineer is at your service with a host of practical ideas to cut costs of operation, or write for bulletin "7 Economies."

LOGAN CO., Incorporated,
510 Buchanan St., Louisville, Ky.

MOVING IS 90% OF MAKING

Logan Conveyors

LOUISVILLE

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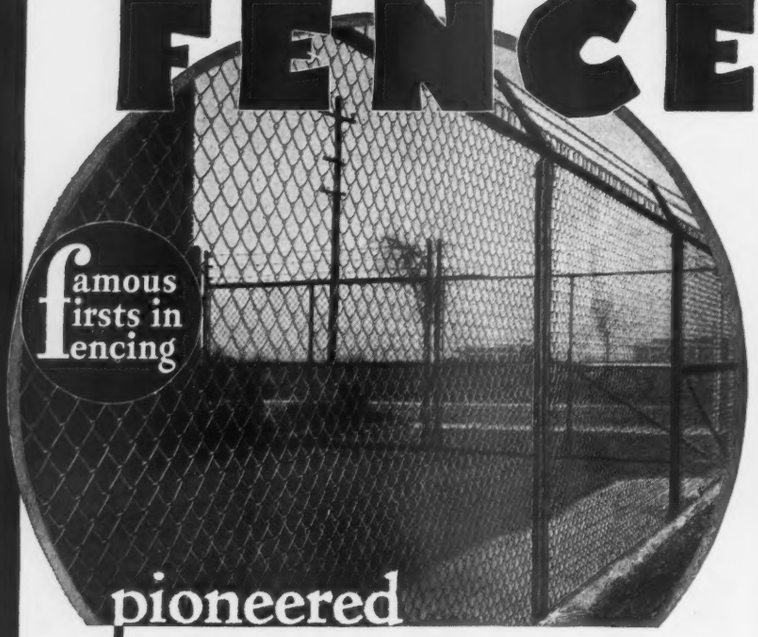
famous firsts in fencing



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PAGE FENCE is offered in 5 superior metals to meet every condition in fencing—Page P-12 Copper-bearing Steel, Page Armco Ingot Iron, Page-Alcoa Aluminum, Page-Allegheny Stainless Steel and Page genuine Wrought Iron. All Page P-12 galvanized fence—mesh, fittings, top rail and new P-12 Wing Channel Line Post—is covered by the 12-dip Preece Test guarantee, the highest known to the industry.

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will overtravel the minimum load angle. Immediately, the load exerts a pull to bring the field back into position to give this minimum load angle. This means that the field must be rotating slower than the stator poles. If this retardation occurs at the same instant as the compressor piston starts its power stroke, the retardation increases due to the increase in the power required.

With a synchronous motor the current varies directly with the load; so the current drawn from the line will pulsate with the load. This may cause light flicker unless there is considerable line capacity. Light flicker is always objectionable to the power companies and must be eliminated wherever possible.

If a flywheel is added to the synchronous motor, the amount of overtravel from the minimum load angle will be less when the compression stroke is completed and the rotor is accelerating to decrease the load angle. This is due to the fact that more time is required to accelerate the larger mass. Likewise, the maximum load angle will be decreased because a longer time is required to decelerate the larger mass. For this reason the accelerating torque or pull exerted by the stator on the rotor will be less, since this also varies directly with the load angle. The result is a definite damping action which limits current pulsation. Therefore, flywheel selection is usually made on the basis of limiting the current variation sufficiently to prevent the lighting load from flickering.

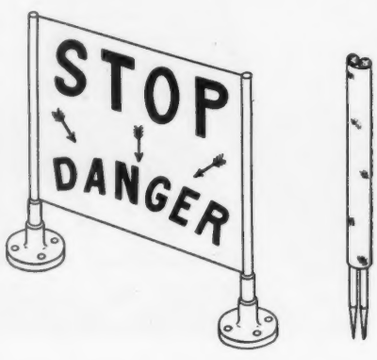
•

Stop! Danger!

C. H. WILLEY, *Penacook, N. H.*

Many times use arises for a safety stop sign. Where maintenance men are working overhead, or where passersby might interfere with moving machinery, there is need for such a sign.

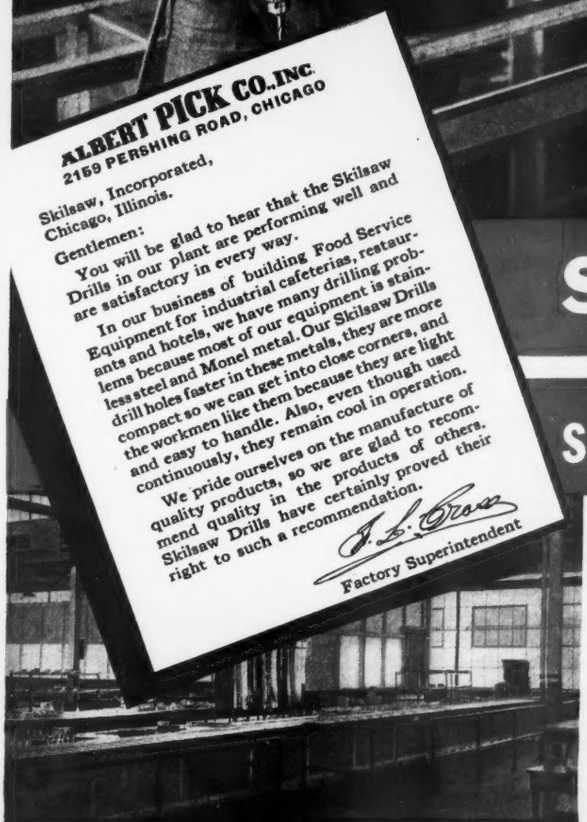
On the sign shown here, a good grade of white duck was used and



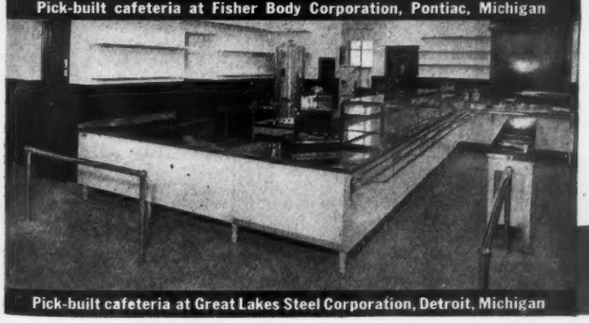
When ALBERT PICK CO., INC.

builds equipment for

industrial cafeterias . .


ALBERT PICK CO., INC.
2159 PERSHING ROAD, CHICAGO
Skilsaw, Incorporated,
Chicago, Illinois.
Gentlemen:
You will be glad to hear that the Skilsaw Drills in our plant are performing well and are satisfactory in every way.
In our business of building Food Service Equipment for industrial cafeterias, restaurants and hotels, we have many drilling problems because most of our equipment is stainless steel and Monel metal. Our Skilsaw Drills drill holes faster in these metals, they are more compact so we can get into close corners, and the workmen like them because they are light and easy to handle. Also, even though used continuously, they remain cool in operation.
We pride ourselves on the manufacture of quality products, so we are glad to recommend quality in the products of others. Skilsaw Drills have certainly proved their right to such a recommendation.
Factory Superintendent

Pick-built cafeteria at Fisher Body Corporation, Pontiac, Michigan



Pick-built cafeteria at Great Lakes Steel Corporation, Detroit, Michigan

SKILSAW DRILLS

save time and labor costs!

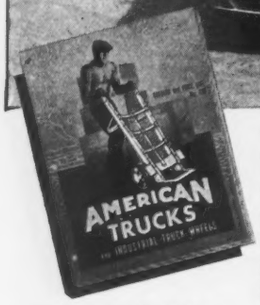
WHAT better recommendation for SKILSAW Drills than this letter from America's outstanding manufacturers of food service equipment . . . who use SKILSAW Drills on jobs that require power, speed and endurance . . . who say that they "are satisfactory in every way!"

Whatever drills you now use, will you compare them side-by-side with SKILSAW Drills? You will find that SKILSAW Drills drill more holes per hour, save more in operation, cost less to maintain! They are engineered to produce those results . . . to stand the gaff—*yet they cost no more!* The next time you buy insist on SKILSAW Drills and you'll never want any other kind!

Made in 18 Powerful Models.

SKILSAW, INC. Dept. E, 3316 ELSTON AVENUE, CHICAGO

They just keep rolling along



"They almost get up and go by themselves." That's what the fellows say who have to operate these trucks. Scientific balance gives them this quicker start . . . this ease in running that makes trucking payrolls more productive.

The cost of a hand truck is the smallest item in handling expense. A little money saved on the purchase price of an inferior truck is soon offset by repair bills and quicker replacements. American Pressed Steel Hand Trucks eliminate perishable wood by using light, strong, tough steel frames that roll on accurately turned, true-running wheels. Hundreds of concerns in every branch of industry have ended up 'way ahead of the game by replacing their truck fleets with "Americans" as needed.

Ask your dealer or write direct to us for the American Pressed Steel Hand Truck Catalog. You'll find models designed for every material handling need.

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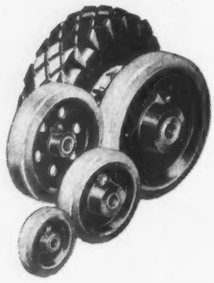
4200 Wissahickon Ave. — Dept. 4 — Phila., Pa.



American Tested Rubber-Tired Industrial Truck Wheels
Our Hand Truck Catalog includes illustrations of every type of wheel used on these trucks with face and hub dimensions engineered accurately for load to be carried. Copy mailed on request.

AMERICAN
PRESSED STEEL
HAND TRUCKS

the lettering was done in red paint. It was mounted on a portable stand made from sections of pipe and discarded flanges. If the pipe sections are merely stood in the flanges and not secured there, it is a simple matter to roll the signs up and store them while they are not in use.

When the sign is to be used in the factory yard, it should be mounted on steel or iron rods pointed at the lower ends so that they may be driven into the ground.

•

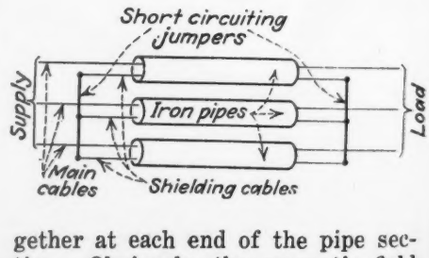
Single A. C. Conductors in Separate Iron Conduits

C. O. VON DANNENBERG
Jamshedpur, India

One of the first lessons that electrical men learn is that a single conductor carrying alternating current must not be carried through an iron pipe. Nevertheless, an emergency situation came up recently in which it was necessary to do just that, and devise some method of preventing trouble.

A sudden increase in load, as well as voltage, overloaded three, three-conductor cables installed in iron pipes laid in concrete. Larger cables were needed immediately, but since the pipes were not large enough to take three-conductor cables of the required size, the method shown in the sketch was employed to overcome the difficulty.

As will be seen, a heavy, single-conductor cable was drawn into each of the three pipes, along with another cable which extends through the 50-ft. length of pipe. The ends of the three auxiliary cables, which are marked "Shielding Cable" in the drawing, were then connected to-



gether at each end of the pipe section. Obviously, the magnetic field set up by the current flowing in the main cables induces a potential in the shielding cables which causes a current to flow in them through the interconnection and thus sets up in each pipe a magnetic field in opposition to the main field, neutralizing it to such an extent that there is no heating of the pipe.

It was found by test that neutralization is not 100 per cent, but

These books can solve your Short Center Drive Problems

These two booklets are of the greatest significance for anyone whose responsibility it is to *increase* performance and *decrease* costs on short center drives. One covers the engineering of V-Belt installations and the applications of Wedgbelt Drives. The other describes the outstanding characteristics of American Tension Control Motor Base Drives. Every Short Center Drive has its own peculiar characteristics. Each case warrants individual study. Have *all* the facts in hand, on *both* basic methods before making your decision on new equipment.

American Wedgbelt Drives

Better grooving, better balance, better bushings combine to make Wedgbelt Pulleys outstanding in their field. They are offered with the definite intention of providing a superior product, based on this company's two score years of producing quality power transmission products.

American Tension Control Motor Base

In its range of applications, both on flat belt and V-belt drives, there is no more efficient short center drive. In many cases it has reduced average belt tensions and bearing pressures 50% —with corresponding reductions in maintenance and replacement costs. Its superiority is a matter of proven engineering fact—its performance can be predetermined with mathematical accuracy.

MODERN GROUP DRIVE PTC

Modern Group Drives offer a real opportunity for substantial savings in mechanical power transmission. Wedgbelt Drives and Tension Control Motor Base Drives are ideal methods for connecting the prime mover with Modern Group Drive Installations.

Send us the facts about any difficult drive, or mail the coupon today for more complete information

The American Pulley Co.
4200 Wissahickon Ave.
Philadelphia, Pa.

Dept. 5

☐ Send your Wedgbelt Drive Catalog.
☐ Send your Tension Control Motor Base Catalog.
☐ Your representative will be welcome.

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—*Advises* SUNNY LUMENS, *the Goodrich Reflexpert*

Wherever men are at work in your plant, their efficiency depends upon the quality of illumination you provide. Light controls the eyes, speeds up or slows down human operations. Good illumination means better working conditions, lower manufacturing costs, fewer accidents. Light is your cheapest production tool. See your electrical contractor.

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NEW GOODRICH CATALOG

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Your copy of the new Goodrich general catalog will be sent upon request. Write for it.

Ask for Catalog No. 38

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GENERAL OFFICES AND FACTORY: 2904 N. OAKLEY AVENUE, CHICAGO, ILL.

it is sufficiently perfected to accomplish all that was intended.

When this procedure was suggested there was some opposition to it, based on the fear that it would not work. Therefore, a test was made by passing 50 amp. through two single-conductor cables in two short pieces of 1¼-in. conduit. A shielding cable was drawn into one conduit. Within 5 min. after current flow was started, the conduit without the shielding cable was uncomfortably hot to the hand.

In effect, of course, a current transformer action goes on in each conduit, the shielding cable being the short-circuited secondary.

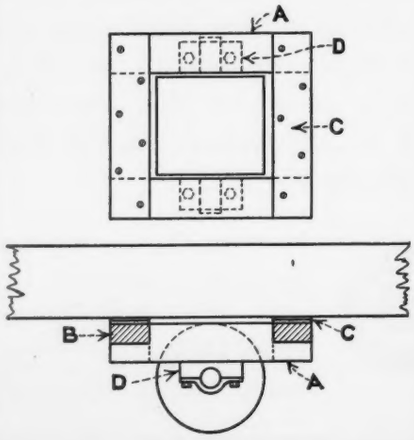
Completely equipped trucks for maintenance men save the boys many a long walk, all needless and expensive.

Heavy Loads Easily Handled on Single-Wheel Dolly

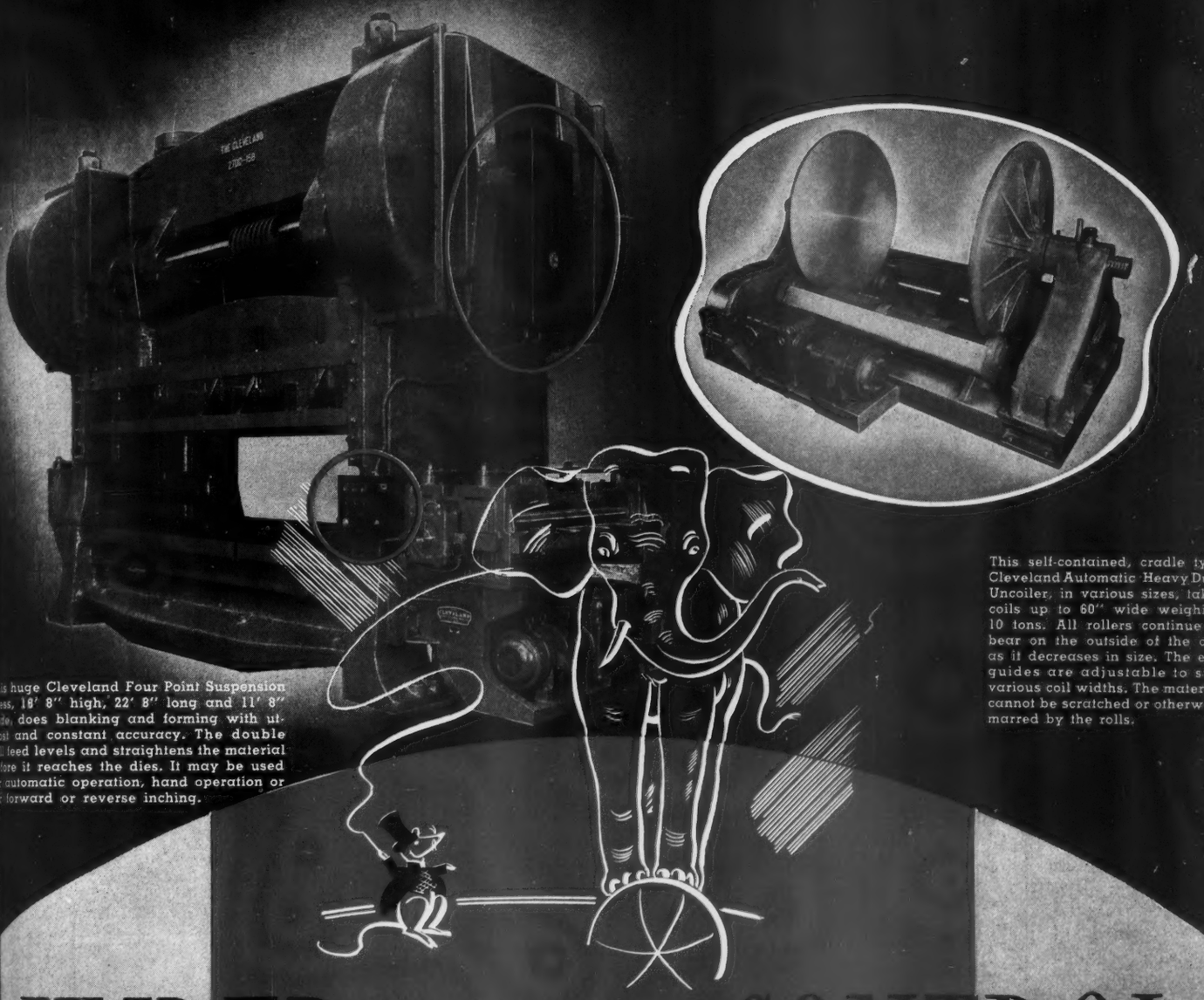
JOHN E. HYLER, *Peoria, Ill.*

The single-wheel dolly shown in the illustration is particularly well adapted to handling and transporting heavy beams, pipe and other loads. It is, of course, possible to use two wheels instead of one large roller, but the latter is to be preferred.

The frame consists of two pieces of square timber, *A*, and two other pieces, *B*, halved together at the corners and fastened with bolts or lagscrews. Two pieces of steel plate, *C*, on the top edges protect the wood from mechanical wear. If preferred



two angle irons may be used, allowing them to lap over the front edge and back edges. Whether angles or plates are used, countersink the screw holes so that the screws will



This huge Cleveland Four Point Suspension ess, 18' 8" high, 22' 8" long and 11' 8" ide, does blanking and forming with ut- ost and constant accuracy. The double l feed levels and straightens the material fore it reaches the dies. It may be used automatic operation, hand operation or forward or reverse inching.

This self-contained, cradle type Cleveland Automatic Heavy Duty Uncoiler, in various sizes, takes coils up to 60" wide weighing 10 tons. All rollers continue to bear on the outside of the coil as it decreases in size. The end guides are adjustable to suit various coil widths. The material cannot be scratched or otherwise marred by the rolls.

UNDER CLARK CONTROL

As a tiny mouse ringmaster might easily direct a trained elephant in his feats, Clark "3C" Controls, operated from a push button station, put vast power presses through their paces . . . One small and compact, the other enormous and massive — both sturdy, powerful and effective — both cooperate for long life and low upkeep with uninterrupted production . . . The nearest Clark "3C" representative will gladly consult with you on your electrical control problems.

* * *

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"3C" RHEOSTATS
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• CRANE CON-
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THE CLARK CONTROLLER COMPANY
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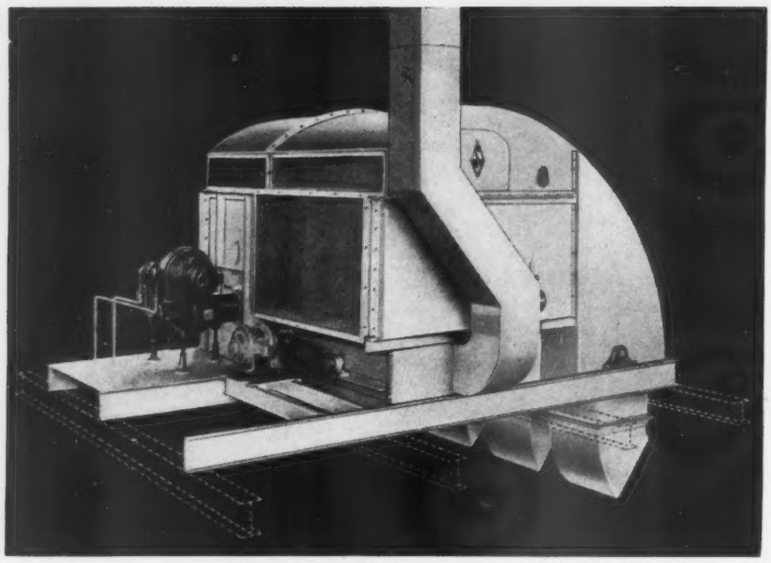
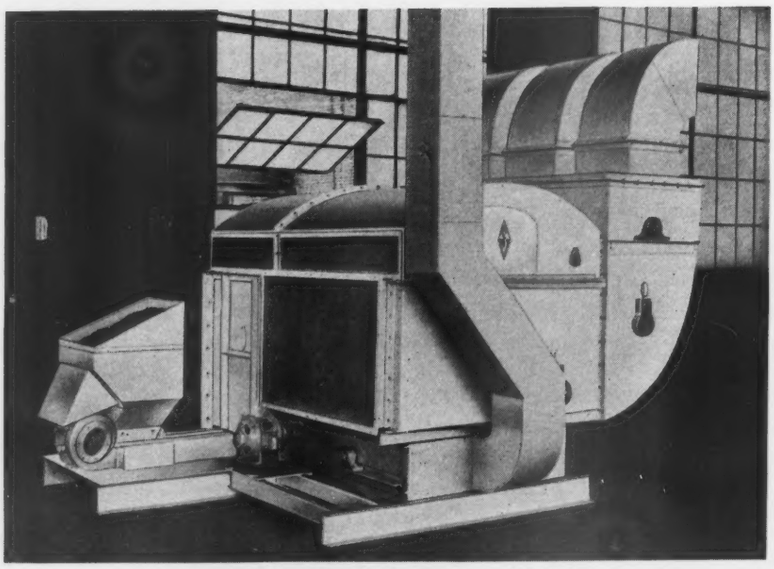


Smith Automatic Oil or Gas Fired Air Heater, available in both floor and platform models. Platform model shown.

Heat That New Building or Plant Addition at a Great Saving!

The Smith Automatic Air Heater burns coal (yes, sir!), oil or gas. It cuts fuel costs as much as 75% . . . You get uniform, clean, thermostatically controlled heat at an enormous saving! You have no boiler room, no foundations, no steam or water lines, no feed water heater, no pumps, no traps! Add air conditioning elements if you like! Set your thermostat and forget it till spring! The Smith Automatic Air Heater is the proven result of 15 years' industrial heating experience! *Get full information now!*

JAMES CAMPBELL SMITH, INC.
1675 Collamer Road Cleveland, Ohio



Smith Automatic Coal Fired Air Heater.

lie flush with or below the surface.

The roller may be made by rolling a piece of heavy plate, or a section of heavy pipe may be used. Webbing may consist of two circles cut from plate and welded securely at the ends of the pipe. If added strength is needed, another circle or two may be welded in near the center of the pipe. The welded roller assembly is then ready to be bored or drilled for the shaft. Almost any type of pillow blocks, *D*, that may be available will serve as bearings.

If the dolly is to be used for handling pipe, it will be advisable to weld small metal blocks on top of the iron plates, to keep the pipe from rolling off sidewise. When one diameter of pipe, or heavy round stock of any one size, is to be handled exclusively the welded blocks may be accurately positioned to give a three-point contact for the material.

Questions and Answers

How Distinguish Between Phase Wires?

We experience difficulty in getting the proper direction of rotation of the three-phase motors driving portable hoists, conveyors, and certain other equipment that is plugged into any one of a number of stations. That is, at one or more stations the rotation may be correct, but at others it is reversed and motor leads must be interchanged. I presume the cause of the trouble is that the same line wires (1, 2, or 3) are not connected to corresponding terminals of all receptacles. But, how can I distinguish the 1, 2, or 3 lines from each other, at the receptacles? I wish that other readers who have had this problem would tell me how they solved it.—L. S.

THE FACTOR which determines the direction of rotation of any three-phase motor is the sequence or rotation of the phases. If the direction of rotation is correct at one receptacle it will be correct at all of the others, if they are connected to the line wires in like manner. It is easy to check the phase sequence at each receptacle with a simple phase rotation indicator.

If one is not available, take two lamps and sockets of the same voltage as the power line to be tested, and an inductive reactance. The latter may be made from a contactor coil and an iron core, and should be connected to the lamps and the receptacles as shown in the sketch.

When the switch is closed one lamp will be bright and one will be dark, as shown. The bright lamp precedes

"All's well . . . *OIL'S SWELL!"*

So says the plant manager of a huge envelope concern when rhythm was restored to minds and machines by swinging to Sta-Put Lubricants.

One year ago these high-film-strength, polymerized lubricants replaced a good grade of machinery oil. Here's the record:

"Our oil consumption has been cut 60%. Before we used Sta-Put we oiled machines every morning. Now we oil *every other* morning, and use less oil.

"No more oil drips on the floor, which means a reduction in fire hazard and increased plant safety.

"Maintenance cost has been cut 30% because of positive lubrication. Bearing and pin failures caused by insufficient lubrication no longer occur. Increased machine life is a natural result."

In turning out many millions of envelopes a day, oil costs and oiling efficiency become most important. That's why they tested Sta-Put . . . and continue to use it. Have *you* tried these unusual oils that are literally revolutionizing lubrication practice? Let us recommend uses in *your* plant. Write E. F. HOUGHTON & CO., Philadelphia, Chicago or Detroit.

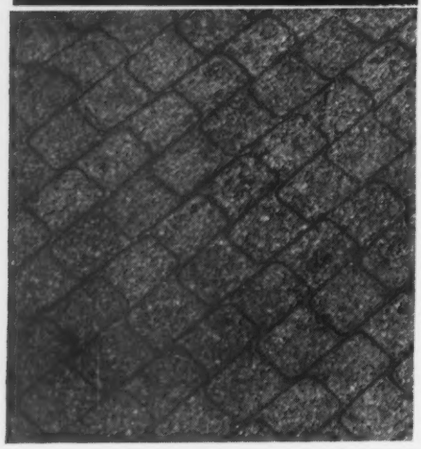
HOW STA-PUT
helped this plant*

1. 60% less oil.
2. 50% saving in oiling time.
3. Less fire hazard.
4. Less accident hazard.
5. Lower maintenance cost.
6. Longer machine life.

*Based on actual attested records.

STA-PUT
LUBRICANTS

NO MORE



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● ACME FLOORSTEEL provides a permanent protection against the wear and damages caused by rolling loads. It is economically and easily installed in new buildings and provides a low cost method of improving or repairing floors in old buildings. A lasting, smooth, quiet and non-skid surface is secured. The small mesh of FLOORSTEEL imbedded flush with the surface in concrete or other suitable floor surfacing material carries the load.

ACME FLOORSTEEL is furnished in standard one piece rolls 47½" or 60" wide and 25 ft. long (special sizes without extra charge). Size of mesh is 1¼"x1¼". FLOORSTEEL is ⅝" in depth, made of high quality specially rolled strip steel, .065 in thickness.

Investigate how little ACME FLOORSTEEL costs in terms of years of trouble-free service. Mail the coupon for complete information and free sample section.

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2831 Archer Ave., Chicago, Ill.

( ) Send me the folder giving complete information about ACME FLOORSTEEL.
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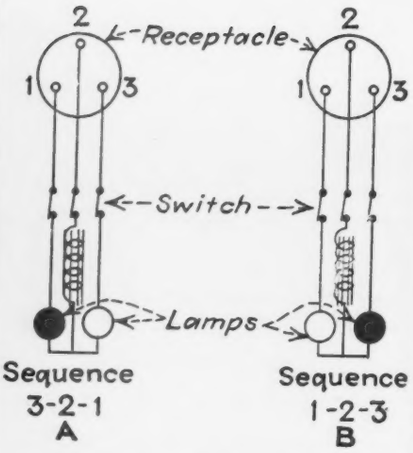

the reactance, and the dark lamp follows it, in the direction of phase rotation. Check each receptacle and make them all alike as to phase sequence or rotation by interchanging any two line wires, if necessary. Then any motor which has the correct direction of rotation at one receptacle will rotate properly at all of them. It makes no difference whether the sequence is as shown in *A* or in *B*, so long as they are all alike.

CHAS. W. WARD, *Kansas City, Kan.*

How Often Overhaul Motors?

We operate several hundred three-phase, 440-volt motors, mostly 5 to 20 hp., with a few 100 hp. or larger. In the majority of cases failure of a motor causes a serious interruption. For that reason we used to take down and overhaul all important motors once a year, besides giving them a careful inspection about every two weeks. Overhauling included cleaning, testing, and painting the windings, checking bearing wear, and in general going over every part. Our conditions are about average to rather severe (there is a good deal of steam and moisture in some departments, dust in others), but failures were very infrequent and usually were the result of some accident.

Several years ago we discontinued the yearly overhauling. Now we inspect motors every three or four weeks, and I know that this inspection is not very thorough. So far there has been only a slight apparent increase in failures, but I wonder whether we are piling up trouble for the future. So my question is: Did we spend too much money before on motor maintenance, or aren't we spending enough now? In other words, is a yearly overhaul justified, or is it a waste of money? I should like to know how other readers feel about this.—V. C.

THE PROBLEM of how often to overhaul motors boils down to the question: How long will a motor run before some electrical or mechanical trouble forces it out of service? Operating conditions to which motors are

Easy to Carry Hard to Upset

(Made in Cincinnati)

Wide leg-spread, correctly angled back assembly, properly spaced steps, wide platform with safety guard rail, plus scientifically placed steel bracings make the Dayton Safety Ladder a standard for safety. Yet it is easily folded, and light in weight. Daytons outlast ordinary ladders—thus reduce ladder costs. Sizes 3 to 16 ft. Moderately priced.

Write Dept. FMM-9

THE DAYTON SAFETY LADDER CO.
121-123 West Third St., Cincinnati, Ohio

DAYTON Safety Ladder

(Patented)

Send for our new catalog No. 5 showing a complete line of accident prevention equipment.

PLANT EFFICIENCY

WAVERLY CITRUS GROWERS, largest packers of their kind, operators of one of the largest truck fleets in their industry, have, like hundreds of others, used Pyroil with complete success for years.

Large plant, large fleet, or small, finds Pyroil invaluable for efficient, safe operation. Keeps production going where often a shut down or serious damage might occur. Guards, bearings, shafts, all moving parts. Controls friction, seizing, prevents corrosive attack (metal wear). Saves many times its cost. Write for facts or Trial Offer. No obligation. Manufactured and Guaranteed by Pyroil Company, W. V. Kidder, Founder, 455 La Follette Ave., La Crosse, Wisconsin, U. S. A.

Founder

THE NEW
SILENT STEEL
SPECIAL DUTY

Bassick
TRUCK CASTERS

SERIES "99"
with 3"-4"-5"-6"-8" Diameter Wheels

Another outstanding development in truck casters ... by BASSICK. Long life, easy swiveling and quietness are fused into this new "99" series.

Projection welding makes possible these highest quality precision assemblies with only *three* parts. There are no rivets... no parts to loosen and cause sloppy action or caster failure. Rigid casters are available to match the swivel.

Write for THE NEW BASSICK CATALOG No. 120

THE BASSICK COMPANY • BRIDGEPORT, CONNECTICUT
THE WORLD'S LARGEST MANUFACTURER OF CASTERS AND FLOOR PROTECTION EQUIPMENT

100 Standard Models of Industrial Counters

Durant *Productimeters* for 58 years have recorded the output in all fields of industry. Counters and registering instruments for almost any industrial use can be supplied from stock. We are also constantly designing counters to meet new or special problems. Let a Durant engineer consult with you on the best means of equipping your plant with counting machines.

Productimeters
THE SPEEDOMETERS OF INDUSTRY

DURANT MFG. CO.
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TELL US WHAT YOU WANT TO COUNT

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THE OLDEST NAME IN PROPELLER - TYPE VENTILATION

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- Plant Ventilation
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ORIGINATORS OF
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Sales-Engineering Offices Everywhere

subjected are so variable that no set rule can be established. Therefore, the period of service between overhauls is an individual problem for each type of motor and service condition.

Generally speaking, there are two conditions to check: mechanical and electrical. Records of periodic insulation tests will show whether the insulation is depreciating, and when it has broken down to the point where further operation of the motor is uncertain. Then the motor should be given whatever repairs are necessary.

The mechanical side of the problem is concerned chiefly with bearings, flexible couplings, belt drives, chain drives, and so on. These elements can easily be examined from time to time and unless new bearings are necessary the repair work can be done, or parts replaced, frequently without delaying production.

Where dampness or chemical fumes are present that would be injurious to the windings, it is best to install a modern-type, fully inclosed motor.

If proper records are kept over a period of time they will show the condition of the motor, and indicate when repairs have become necessary. From then on these records will indicate the frequency of repair work. If the same repairs are found to be necessary at too-frequent intervals, consideration should be given to changing the type of motor, or its size, or to making such alterations as may be desirable.

HARRY W. BENTON, *Plant Engineer*
Pratt & Whitney Division
Niles-Bement-Pond Company
Hartford, Conn.

Reader Wants Answer

Drying Out Large Turbo-Generators

Two 1,000-kva., 2,200-volt, 385-amp., 3,600-r.p.m. turbo-generators have been idle for several years and I want to dry out the windings which are showing signs of mildew. Insulation resistance tests show 100,000 ohms. Since there is no steam available to drive the machines, I expect to short-circuit all phases (one phase through an ammeter) and drive the generator and turbine by a slipring motor, through a belt around the coupling. The only motor available is rated a 25 hp., 600 r.p.m. Can anyone tell me at what speed the units will have to be driven in order to obtain sufficient current for drying? How many amperes should be forced through the winding? Field current will be supplied by a separate motor-generator set. Any suggestions you can give me will be much appreciated, —*R.G.M.*

The original cost of a hand truck is no guide to its *actual* cost. It is the first cost, plus upkeep and the length of service it gives, that determines the real cost. Figured on that basis, Fairbanks Hand Trucks are far the cheapest.

No other hand truck approaches the defiant ruggedness and the long life of the Fairbanks, for the reason that it possesses the combined good features of both steel and wooden trucks.

Fairbanks Hand Trucks have steel straps on the front and back of the well seasoned wooden frame, which prevents wear and provides greater strength. Crossbars are set flush on top of the wooden frame—no mortises to weaken the frame.

Handles cannot work loose as they are part of the frame. Nose iron can be replaced by removing only six bolts. Every part subject to excessive wear can be replaced inexpensively and easily.

Fairbanks Trucks can be equipped with rubber tired wheels to eliminate noise, prolong the life of truck and protect floors from wear.

Write for Catalog 955.

THE FAIRBANKS CO.

Hand Trucks, Wheelbarrows, Valves and Dart Unions

401 Lafayette St., New York, N. Y.

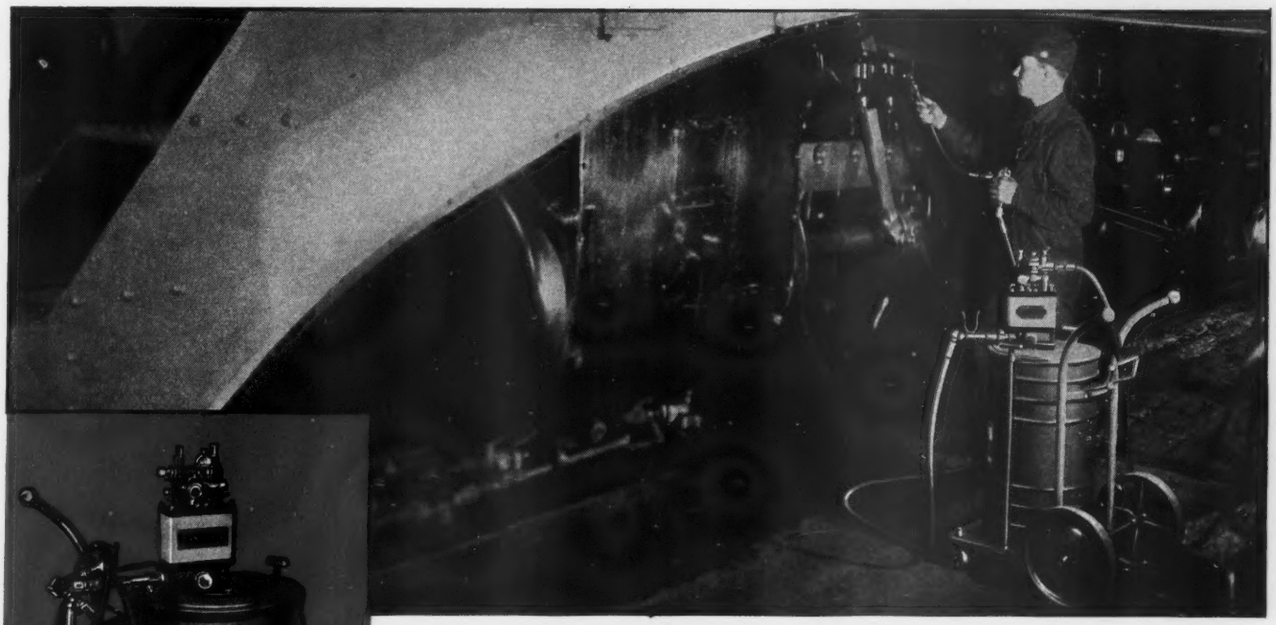
Boston, Pittsburgh — Distributors in Principal Cities

Factories: Binghamton, N.Y. Rome, Ga.

Fairbanks
HAND, PLATFORM and BOX TRUCKS

THE SOUTHERN PACIFIC R. R. USES LINCOLN EQUIPMENT

Such recognition must be merited!



LINCOLN
LUBRICATING EQUIPMENT
is designed to meet needs of all types of industries

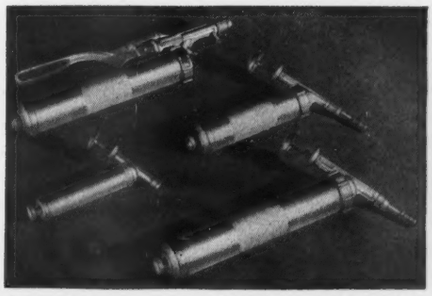
More and more, Lincoln Lubricating Equipment is being used in factories, mills, mines, roundhouses, on contractors' equipment, on farm implements, in the oil fields, and in many other places by those who realize the importance of utilizing the best equipment for lubricating bearings and other moving parts.

The complete industrial line manufactured by Lincoln includes lubricant dispensing equipment ranging from small hand guns (shown below) to heavy duty power operated equipment. (Picture above shows one of a fleet of Lincoln Model 309 Lubriguns in service of the Southern Pacific.

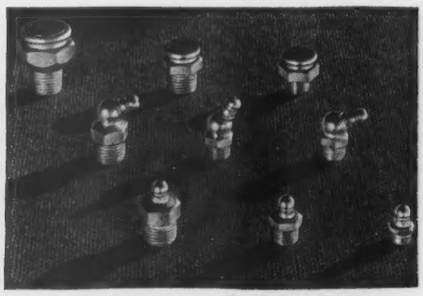
All Lincoln Power Operated Lubricant Dispensers, Hand Guns, Fittings and Accessories are illustrated and described in Catalog No. 60 . . . A copy is yours for the asking—and we are sure you will find that it covers just the equipment you should have to lower maintenance costs in *your* factory.

Model 309 TWIN CYLINDER AIR-LINE LUBRIGUN (shown above) dispenses lubricant directly from an original 100 lb. capacity drum. This unit is capable of handling semi-solid oils as well as viscous and fibrous greases.

This portable model is mounted on a truck which has 12" rear wheels and swivel front casters, and has handles which make it easy to push this unit from job to job . . . Equipped with 10 ft. hose, lubricant control valve and Flex-O-Matic Air Coupler for quickly attaching air hose.



A few of the many types of hand operated Lincoln Grease Guns are shown above. The complete line is shown in Catalog No. 60.



Lincoln KLEENSEAL and Button Head Fittings in all types and sizes are available for replacement and modernization needs.

LINCOLN ENGINEERING COMPANY

PIONEER BUILDERS OF LUBRICATING EQUIPMENT

GENERAL OFFICES, ST. LOUIS, MO. FACTORIES: ST. LOUIS, MO., DETROIT, MICH.

Eliminate guesswork with Sonneborn's Tested Products

The men who are responsible for construction and building maintenance appreciate the importance of specifying only those products which have stood the test and proved themselves outstandingly satisfactory "on the job."

In today's building operations there is no room for guesswork—no room for the product that "might be o.k."

Superintendents, architects and builders know that for over 30 years, SONNEBORN quality has been uniformly high—kept that way by a complete technical and research staff constantly working, testing and improving SONNEBORN products to keep them abreast of the times in the building field.

If you have any problems or plans concerning Waterproofing, Dampproofing or Painting, call on our Engineering Department. They will gladly give you the benefit of their advice and experience. And, of course, you're not in the least obligated.

Write today for complete literature on SONNEBORN'S Tested Products. Address Dept. FM9.

SONNEBORN'S TESTED PRODUCTS

LAPIDOLITH— The guaranteed method of securing dustproof concrete floors.

LIGNOPHOL— A scientific penetrating preservative and finish for wood floors.

HYDROCIDE COLORLESS— For exterior waterproofing of masonry walls.

SONOMEND— for patching and resurfacing wood and concrete floors; an easy to use method for prolonging the use of floors.

KAUKIT — Non-shrinking waterproof caulking compound.

CEMCOAT — Light reflecting enamel for interiors also waterproof coating for exteriors and floors; is outstandingly superior for masonry surfaces.

CEMENT FILLER AND DUSTPROOFER — Double service plus decorative floors; a penetrating, tough flexible floor coating of outstanding performance.

STORMTIGHT — Roof protection; a name that guarantees maximum roof protection at minimum cost.

S. R. P. — Rust protective coating for metal surfaces; paint over rust without expensive preparation.

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Every Foot Quickly Available and at Lowest Cost

Paper storage bay in plant of Owens-Illinois Glass Co., Gas City, Ind., served by W hiting 5-ton Tiger traveling crane. Note excellent lighting by means of special glass blocks manufactured by Owens-Illinois Co. (The Austin Co., Cleveland, Ohio, Builders.)

WHITING Tiger CRANE

Every square foot of floor area in this modern storage bay is quickly available and at lowest cost because of the Tiger overhead crane with motor-operated special grapple controlled by crane operator from the cage. The crane man quickly spots and delivers any particular stock desired.

Here, as in so many other material-handling jobs, the Tiger crane supplies efficient, dependable overhead transportation — the kind of transportation every modern plant should have for profitable production. Because it also operates at low cost, the Tiger crane is the answer to many industrial handling problems. Let us show you how a Tiger crane can help you earn greater profits.

SEND FOR CATALOG 300

WHITING CORPORATION • 15689 Lathrop Avenue • Harvey, Illinois

Electric Traveling Cranes
Foundry Equipment
Railroad Equipment
Pulverized Coal Machinery
Stokers — Special Machinery

WHITING

PIONEERS SINCE 1884

Sayings and Doings

195 Firms Say There Is Skilled Labor Shortage

A serious shortage of skilled labor is revealed by a survey recently conducted by The Warner & Swasey Co., Cleveland, makers of machine tools and precision instruments. The survey is based on replies to a questionnaire on the employment situation received from 229 concerns in a wide variety of important industries, employing a total of 791,820 people.

To the question, "Are you experiencing a shortage of skilled labor?" 195 firms said "yes," 34 said "no." Types of workmen chiefly needed were given as machinists, toolmakers, machine operators, lathe operators, boring mill operators, automatic screw machine operators, and molders.

Questioned as to the best method of training new men, 133 firms said the best way was to employ them and teach them in their own plants; 7 firms recommended joint training schools cooperatively run by industries; and 18 said they relied upon trade and vocational schools.

In answer to questions dealing with transferring men from relief or public employment into private industry, 182 firms said that the men they had employed during the last two years had not come, to any great extent, from these sources, while 39 companies said that they had taken in a number of men from government projects, and many firms said that they were securing active cooperation from relief or public works agencies in transferring men to industrial jobs.

While a number of firms expressed the opinion that men on relief or government projects belonged in the unemployable class, comments on the whole indicated that a certain share of unskilled men on relief or public employment could be trained and reabsorbed into industry. One company gave specific figures on this subject. This company said:

"We have hired approximately 300 men from these sources, of which about 35 remained; balance released or quit. Majority either lack skill or have no desire to work."

"With apparently practically all of the skilled workers of the country already working," Philip E. Bliss, president of Warner & Swasey, said in commenting on the questionnaire, "industry might at least make a broader effort to try out men on relief or federal payrolls just as it today must of necessity experiment with younger men now coming into the employment field. I believe that within the next few years industry will have need of all the men who can possibly be trained.

"According to the answers to the questionnaire, majority opinion indicates that the best method to train men is to employ them and try them out inside the plant. Of course, this involves sorting out the competent from the incompetent, but in the process industry stands to gain a certain number of new, skilled workmen who will stand in good stead in the period of still greater productivity which is in store for American industry."

Here's Evidence

CONTROLLER DUTY

EC&M LINE-ARC Magnetic Contactor used in controlling a 35" Blooming Mill Screwdown which is driven by 2—85 HP Motors operated in series.

- Contacts are changed every six to seven weeks.
- Arc Shields show no destructive burning.

PREVIOUS CONTACTOR

- Contacts were changed every 24 to 48 hours depending upon the frequency of operation.
- Arc Shields were changed every week.

ON WELDER SERVICE

EC&M 600 Ampere LINE-ARC Magnetic Contactor installed on severe duty butt-welding application.

- After 9 months of continuous operation (making 28 operations per minute, 24 hours per day, 7 days a week), this contactor is still equipped with the original contacts and arc shields.

PREVIOUS CONTACTOR

- This contactor was rated at 1000 Amperes, continuous capacity, but the service is so exacting that the contacts sometimes welded together 2 or 3 times a day, necessitating frequent attention and renewal of the contacts about every third week.

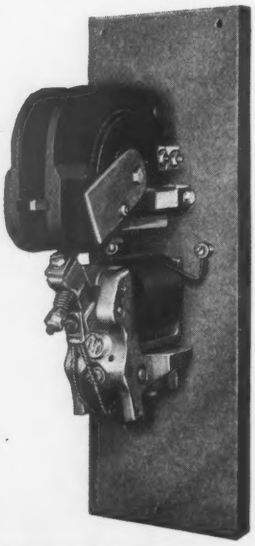
that LINE-ARC MAGNETIC CONTACTORS

reduce time-outs..give a high return per dollar invested

IMAGINE nearly 11 million operations—without replacement of arc-handling parts . . . as given by the EC&M Line-Arc Contactor on the above welding application.

In these contactors, the scientific method of handling the arc as the circuit is ruptured, has established a new low in operating costs—resulted in better profits from fewer interruptions and less expense for replacement parts.

Write today for Bulletins describing these highly efficient contactors. No. 1140 for a.c. and No. 1145 for d.c. controller service. Bulletin 1141 for resistance welding applications. The Electric Controller & Mfg. Co., Cleveland, Ohio.



THE ELECTRIC CONTROLLER & MFG. CO. E&M CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

The Caterpillar Case History in Bargaining

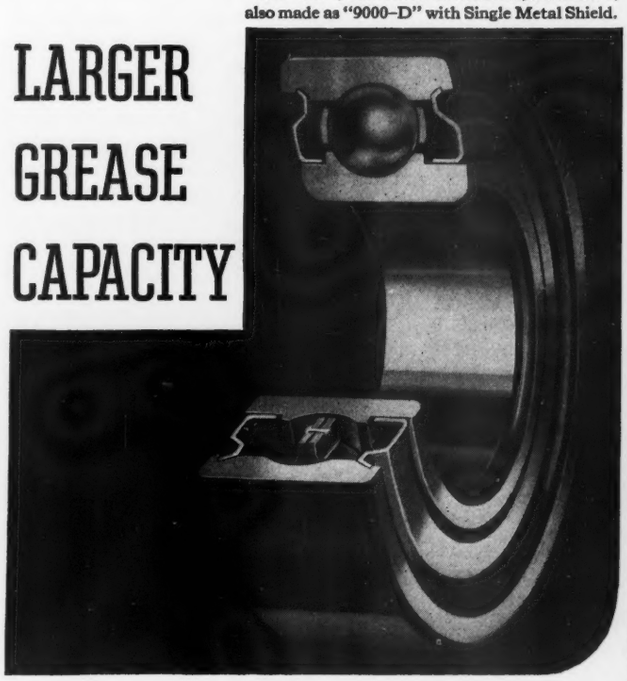
(*Continued from page* 52)

it will hardly be rendering a humanitarian service.

Item VIII was the demand that a conference be held, and "here is the conference under way at this moment." He then asked the CIO committee to proceed, and Organizer Dernoncourt asked a few questions, asked the company's position on the request for sole bargaining power to his union, received a restatement of the company's willingness to bargain with any authorized representative of any employee, and assurance that by the very presence of

"9000-DD", with double Metal Seals, here shown; also made as "9000-D" with Single Metal Shield.

LARGER GREASE CAPACITY



NO SEAL DRAG

IN "9000" SERIES (Feltless)

SELF-SEALED BEARINGS

Interchangeable in dimensions with felt seal bearings.

Employs simplified, inwardly extending, flanged metal shields which do not rotate and cannot "foul" other rotating seal parts.

Seals are highly efficient in retaining grease in either horizontal or vertical position.

Simple seal occupies less space within bearing than felt seal, PROVIDING GREATER GREASE CAPACITY AND A MORE LASTING LUBRICANT SUPPLY.

Metal seals, though close fitting, clear recess on inner ring, ELIMINATING "DRAG" OR FRICTIONAL RESISTANCE and power loss, and providing higher starting speeds and increased efficiency. Seals cannot wear and are permanently effective.

Totally sealed against foreign matter, providing absolute cleanliness at all times.

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PRECISION BEARINGS

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HOW TO GET LOW PRODUCTION COSTS

Production figures are on every one's tongue. They spell profits—or losses. A real contribution to the solution of one important factor, that of *application of power to work to be done*, has been made by the Power Transmission Council of Boston. It has attempted to call to the attention of management the need of *analyzing mechanical power application* from the standpoint of results desired, and using the best means for that end, be it lowered cost, increased production or greater uniformity of products.

Frequently it is found that marked advantages are obtainable from the adoption of Modern Group Driving, and that a well laid out Flat Belt Drive with the most efficient leather belting obtainable gives the lowest unit cost of production.

Rhoads Tannate Leather Belting, with its low stretch and high capacity, has been found by many very successful industries to give increased production, coupled with long life, fewer shut-downs and low maintenance cost. Often users have reported not only lower unit cost of product but also better quality and larger output.

If you have drives from which you suspect you might obtain some of these advantages, too, please ask us for suggestions. It may mean added profits for you as it has for others.

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Caterpillar employees on his committee his authority to speak for some Caterpillar employees certainly could not be questioned.

Then, after further conversation, the CIO committee requested a five-minute recess for private discussion in an adjoining room, and after the recess read the agreement which it was submitting for signature. It subsequently was stated by the union representative that the agreement was almost identical with that signed by the U. S. Steel Corporation.

President Heacock talked on one point included in the proposed agreement which had not been in the previous demands, that of submitting to an impartial umpire any dispute which should not have been satisfactorily settled by a designated system of negotiation. This he restated as turning over to someone who had not qualified for management of the company a responsibility which management must restrict to itself if it is to be held responsible by the owners and the customers of the company.

He pointed out that no competent carrying of responsibility is possible without authority, that John L. Lewis certainly does not divide his authority when he carries responsibility. And he stated that this was one of the company's fundamental positions which he had not previously covered because the subject had been brought into the conference after his previous statement of position on points previously raised. Then he turned the meeting over to Vice-President Connor as spokesman for the management group.

Organizer Dernoncourt asked for a categorical statement of whether the company would sign a written agreement if its terms could be agreed on. Connor said, in effect, "That we cannot answer until we know what is being agreed to and what you want us to sign." To Dernoncourt's question of how long it would take for the management to make up its mind, the answer was made that this would depend upon how much time the management could give to considering it, and how quickly it could decide.

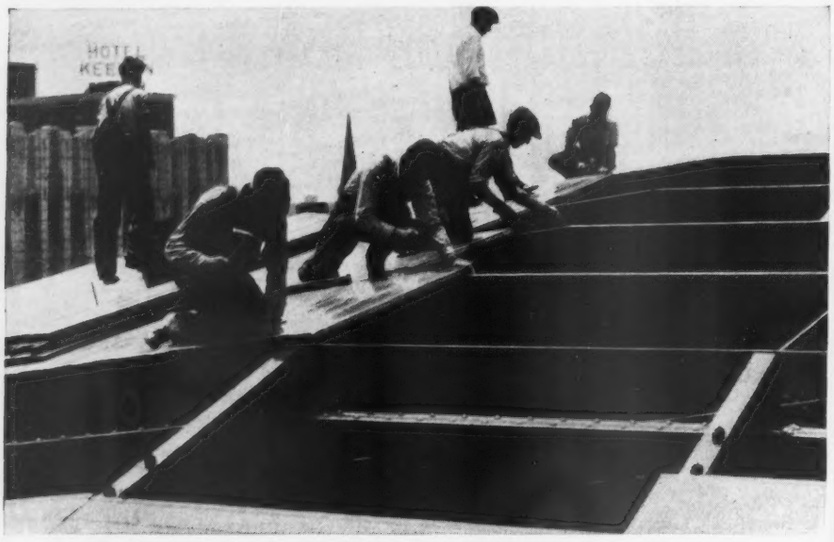
Management Studies Agreement

At the union committee's request a recess was granted, and after 20 minutes the committee returned and agreed to furnish a copy of the agreement so that the management might study it. The committee stated its opinion that 10 o'clock Wednesday morning—this was Monday afternoon—would be late enough for the management at least to start negotiating.

President Heacock explained that he must leave the next day for the company's annual meeting in California, that he would return on April 5, that he could make it no quicker. After some argument, the management's time was agreed to, since it was agreed that no great emergency existed. It took the committee a 15-minute recess to come to this decision, and to set the next meeting for April 6. Then, after a little more talk, it adjourned.

The court reporter's verbatim account of the meeting was rushed into print and was ready next day, so that copies of it in booklet form were handed to all employees of the morning shift when they went off duty that afternoon, and similar distributions were made at midnight and next morning to the other two shifts. This time was chosen for two reasons: So that the men might read the booklet thoroughly on their own time; and so that their wives might have a chance to read it. The management felt that a wife's opinion might be a stabilizing influence.

The second meeting, on April 6,



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And how a Fenestra Holorib Roof goes to bat for you in such a crisis! Nothing to pour! Nothing to freeze! Nothing to dry out! Laid in any weather in which men can work!

The steel deck arrives in sheets 18" wide—light,—easily carried by one man. Applied in a jiffy, clipped or welded to the purlins. The end of one sheet telescopes into the end of the next. The sides of adjacent sheets overlap and nest. As soon as the deck is on, your building is protected, so that other trades can continue with their work.

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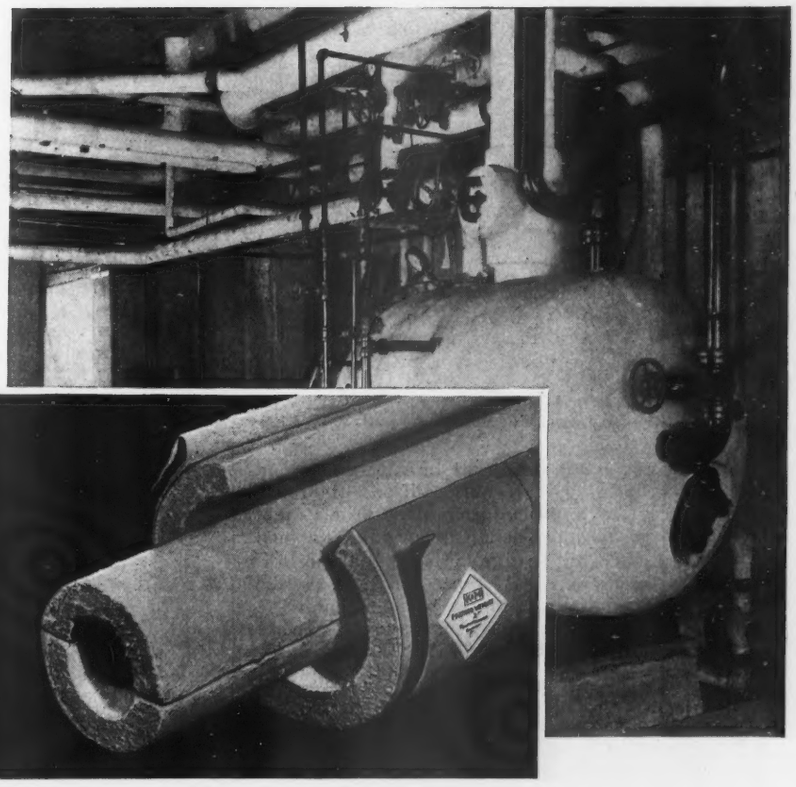
Heat insulation of enduring efficiency



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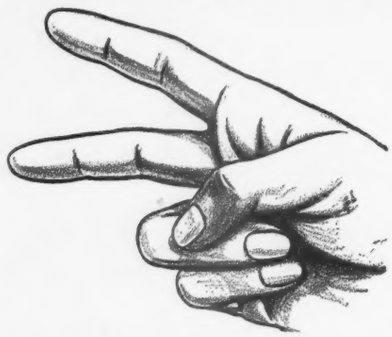
was short but less sweet. Vice-President Holt opened the meeting, saying it was a continuation of the meeting which had been held on March 22. He introduced the twelve negotiators, the same four executives for management and the same eight committeemen for the CIO union. The same general group of spectators and newspaper men was present, in the same room as before.

Holt read the proposed agreement which the CIO had submitted and stated that it would be impossible for the company to enter into any agreement with any organization without being fully informed as to its purposes, practices, and objectives. He then read off a series of seven questions as to the composition and status of the Steel Workers Organizing Committee and the Amalgamated Association of Iron, Steel, and Tin Workers, and its jurisdiction over the industry.

He inquired why the words "or its successor" had been inserted after the names of the union, and asked for more definite information about the successor or successors, and its effect upon the workability of any agreement negotiated with the present union. He asked for a copy of the constitution and by-laws of the union, asked whether a successor organization would have the same organic law, whether members are furnished copies.

He asked for further light on how the agreement would "promote and improve industrial and economic relationships between those employees who are members of the union and the corporation," and whether the present industrial relations enjoyed between the employees and the corporation were not already at a high degree of perfection.

IT'S "DOUBLE-SAFE"
WITH DOUBLE BRAKES



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What Will the Costs Be?

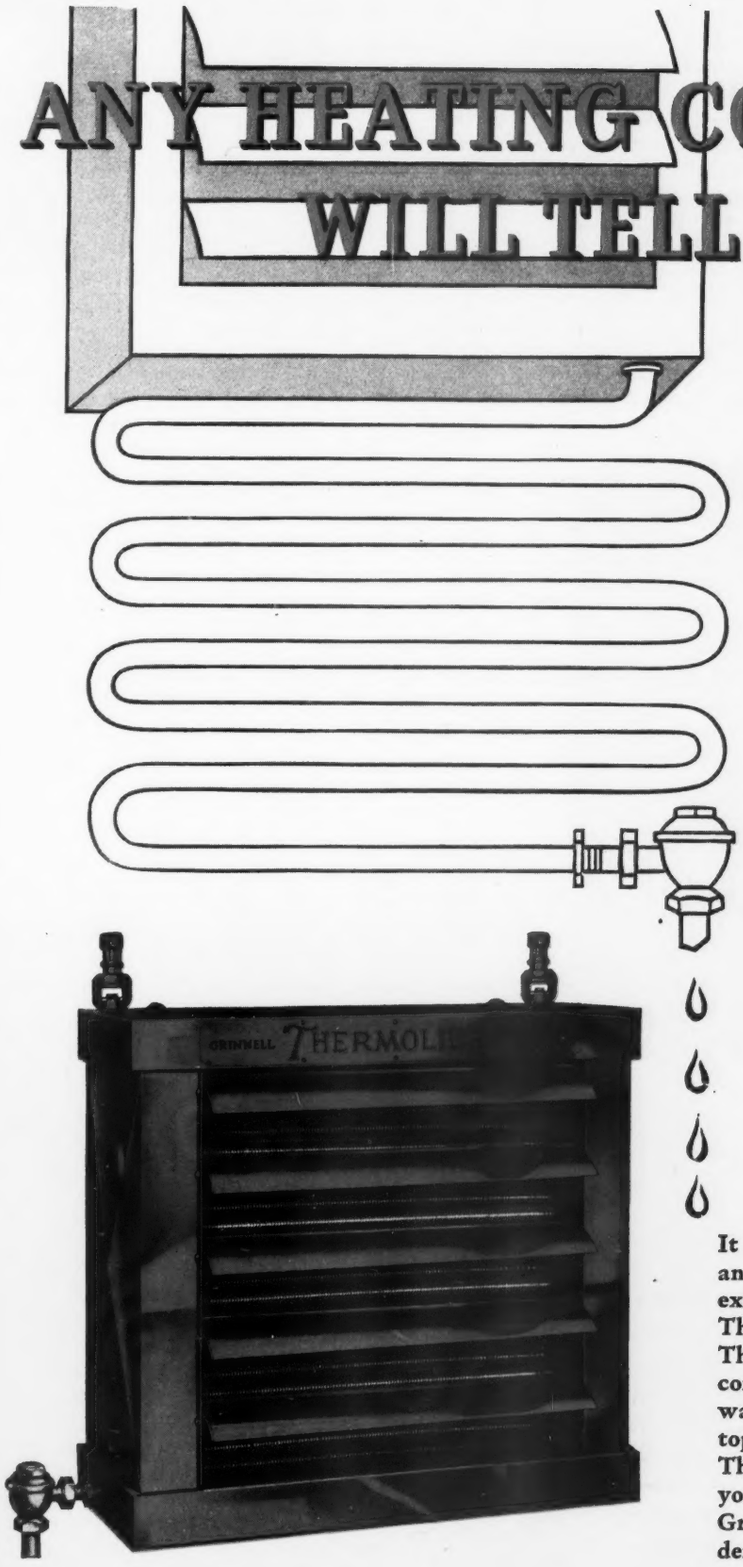
He stated that, in view of the request that the company agree that economic relationships would be improved, the company felt it must inquire into the cost involved on the part of the members of the union, because costs become an inherent part of any economic relationship. He asked the following questions:

"Are you now collecting initiation fees? If so, how much? Are you now collecting dues? If so, how much? If you are not collecting either, when do you contemplate initiating collections of these fees? What initiation fees do you intend to start collecting at that time? What dues do you contemplate collecting at that time? And what dues will your one or possibly many successors elect to collect in years to come?

"What dues are being collected in other CIO affiliates in other locations? What is the maximum? Isn't it a fact that dues in some of them are $5 a month? What will these dues probably amount to per month? Are we amiss in thinking of a computation about like this: Say 5,000 members at a $2 initiation fee—a total of $10,000? Would there be a difference in initiation fees for the members who join now and the members who join at a later date? If so, how much? Is it unfair to think that you would collect not less than $1 per month per member? Isn't it the thought that you would get something like $5,000 to $10,000 per month from Caterpillar employees?

In judging as to whether this will better economic relationships between the company and the employees, then, it becomes necessary to inquire as to the disposition of these large sums of money. In what manner or what proportion will this money be spent for the benefit of the people who contribute the funds? What proportion of it stays in Peoria? What proportion goes out? And how is the money used that

ANY HEATING CONTRACTOR WILL TELL YOU . . .



WITH THIS COOLING LEG

THIS THERMOSTATIC TRAP WILL OPERATE *PERFECTLY!*

It will keep a Unit Heater free of condensate and operating at 100% efficiency . . . if you examine the construction of the Grinnell Thermolier you'll find this feature *built in*— Thermolier's exclusive Internal Cooling Leg continuously removes condensation — "lazy water"—keeps *all* of the heater working at top efficiency, *all* of the time. Only one of Thermolier's 14 points of superiority! Ask for your copy of the Thermolier Data Book. Grinnell Co., Inc., Executive Offices, Providence, R. I., Branch offices in principal cities.

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THE UNIT HEATER WITH 14 POINTS OF SUPERIORITY

stays here? How is the money used that goes to headquarters? What accounting is given to members regarding the disposition of their funds?

Frank answers to the above would be very helpful to us in determining whether or not we would be desirous of having an agreement between your organization and the company. Incidentally, it would seem to me that any employee of our company who might consider taking out a membership in your organization might very well require answers to these questions before he joined your organization. If you are agreeable, we will be very much interested in hearing your replies to the above questions."

Next Mr. Holt stated that while old employees were already familiar with company practices in employee relationship, some of the newer employees might not understand these so thoroughly and therefore the company was about to post on all bulletin boards a statement which he then read to the meeting.

In essence, this was a statement of long-established policies. It included the right to bargain and discuss matters affecting employment, in person or through authorized representatives. It stated the right of any employee to join or refrain from joining any or all unions. It affirmed the company's effort to arrange manufacturing schedules to provide continuous employment. It stated the company's policy to pay wages as high as generally prevail locally or in its industry.

It continued the 8-hour day, 40-hour week, time and one-half for overtime with a few generally recognized exceptions, seniority, continuation of apprentice system and other training courses for bettering employees' skills, continuation of optional group insurance, physical examinations as a safeguard from infection and to assign workers to jobs for which they are fit. It promised a continuation of clean factory, safety work, recreational activities, and the like.

No Need for Agreement

Mr. Holt pointed out that there was no need to enter into a signed agreement with the CIO or any other union so long as this agreement is in effect. Mr. Dernoncourt demanded a categorical answer to whether the company's position was that there would be no contract with the Steel Workers Organizing Committee. Mr. Holt answered that the management believed that, company policies with employees being well understood by them, there was no room for it, and no need for it.

Mr. Dernoncourt said there was nothing more to talk about, that his committee would retire. It did retire, the signal was given outside, and immediately a group of perhaps 35 men on the tractor assembly line sat down and refused to work.

It took about 15 minutes for the company officials to reach the point of trouble. By that time, the assembly room was in greatest confusion, since the sitdowners were sitting down or, more accurately, were refusing to work. Two supervisors had been badly slugged by an employee who was leader of the sitdowners. Other workmen were trying to do their jobs, hundreds all over the plant were standing around looking on and wondering what it was all about. The company officers took one look at it and said, "There is no occasion for having trouble here. We'll stay shut until this can be worked out in some way, until we know where we are."

On the way back to the office building, the officials were halted at the steps by a group of employees.

Strange Paradox . . . . .

Material moving systems that do the work of many men are installed . . . costs are lowered . . . production and profits increase . . . and more labor is employed at higher wages—the strange but true story of conveyors . . . of all labor saving machinery. No matter what you handle in production, storage or shipping, it will invariably pay you to consult a Webb Engineer —this service, of course, entails no obligation.

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4-WAY SAFETY . . . equal traction in all directions for foot or wheel.

4-WAY CLEANING AND DRAINAGE . . . easy sweeping and quick drainage save daily maintenance time. There are no dirt-catching pockets or corners.

4-WAY STIFFNESS . . . equally rigid lengthwise or crosswise because projections overlap one another to reinforce the plate. Yet, because of the high quality rolled steel used Inland 4-Way Floor Plate can be bent uniformly and formed as desired for special applications, such as steps, etc.

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SAFETY TREAD
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You can do it with INLAND 4-WAY FLOOR PLATE

Work moves faster when feet and wheels are safely geared to this non-skid flooring. Slipping and falling accidents, the most common source of employe-injury and lost working time, are prevented.

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Three synchronous motors (two 100 hp. and one 150 hp.) driving compressors in a brewery.

HOW DO YOU SELECT YOUR MOTORS?

In selecting the proper type of motor for any drive there are many factors to be considered.

Take a compressor for example. If initial cost is the most important consideration, and plant power factor can be ignored, the squirrel cage induction motor is the obvious choice for small and medium size compressors. For large heavy duty compressors, designed to last for many years, the smooth acceleration and low starting current of the slip ring motor justifies its use. But if there are already a large number of induction motors in the plant, probably the best choice would be a synchronous motor of the proper capacity to supply the needed corrective kva. And then there is direct current....

But why not call the nearest Crocker-Wheeler office and obtain the services of an experienced application engineer?

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EXCELLENT ENGINEERING

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SALES OFFICES IN PRINCIPAL CITIES

These men said, in effect, "We want to work. Shall we go in and throw the strikers out? We want to get organized and prove there is no majority wanting a strike here. How can you help us?"

President Heacock told them, "No, don't let's have any fighting. And the company cannot help you in any way. This is not our doing, and if you want to help the company you can. Figure out your own ways, and do whatever you think best. But it's up to you, not to the company."

The usual phenomena of a sit-down strike developed at once. There were strikers inside armed with clubs and other weapons, there was mass picketing outside by pickets similarly armed. The company did not, however, seek any legal or other redress. There were no injunctions. The factory workers who wanted to keep on working organized entirely on their own without any outside help, rented the local armory for an election, had ballots printed on the question of whether a given employee wanted to work or to continue the strike. They obtained three impartial supervisors from townspeople, induced the law authorities to keep order, got publicity on the radio and in the newspapers for their election to be held next day.

When a worker presented himself, he had to show his badge or pass, and then enter the building. Inside, a hat was passed for contributions to pay committee expenses. When apparently everybody had entered by the stated time of election, the doors were closed, each person present marked and deposited his ballot in a ballot box, and left the building. No one else was admitted after the doors were closed.

Vote to Go Back to Work

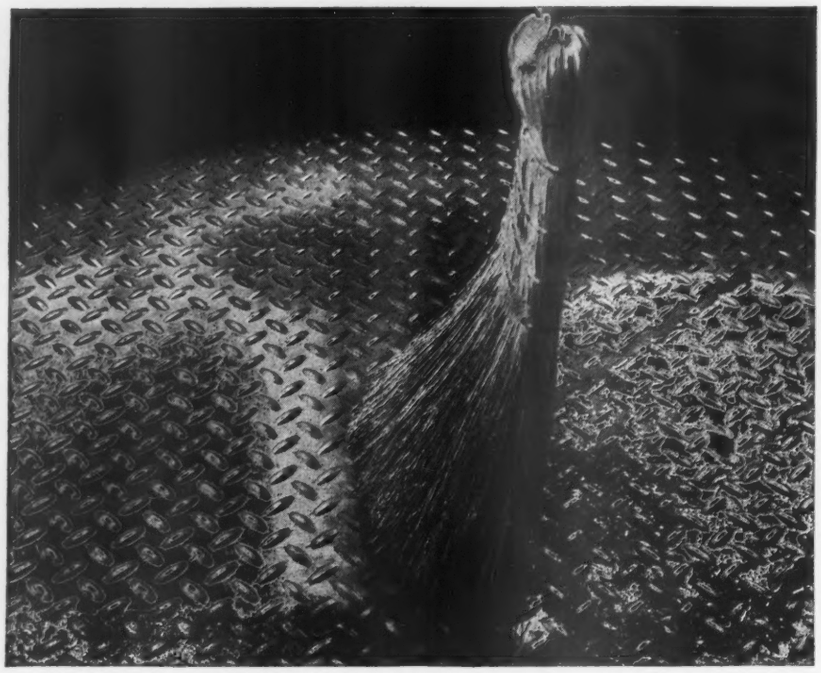
The committee had provided something less than 5,500 ballots, and when these had all been used there were still several hundred people waiting to vote. Doing the best it could, the committee simply closed the balloting and left these few folks unrepresented. CIO leaders had ordered their people not to attend the meeting and not to vote. The balloting ran 5,151 for going back to work, to 286 for continuing the strike. Since the company had about 11,000 employees, it was almost a 50 per cent vote for returning to work, and seemed indicative that the workers' sentiment was heavily against the strike.

The day after the strike was called, every local paper carried a paid full-page advertisement presenting the company's statement of labor policy; it had to be presented thus, since the employees no longer had access to bulletin boards. Local newspapers contained full accounts of all steps, including liberal excerpts from the proceedings of the meeting which the CIO men had left to call the strike. And a representative of the state department of labor, Joseph J. Vincent, entered the scene.

Negotiators Meet Again

On the second day he approached the management. He reported that he had talked with the CIO men, that they were entirely willing to continue discussion, and asked whether the management would have a meeting. The management replied that the previous meeting had been ended by the union representatives rather than by the management's choice, and that the management was entirely willing to reconvene the meeting at any time satisfactory to the union. Accordingly, that afternoon the same twelve negotiators met again, with Mr. Vincent present.

The company preferred having the same witnesses as before, but yielded



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No dirt catching pockets or corners—
clean, safe, strong, economical

● Inland 4-Way floor plate with projections centering one another at right angles gives four way traction for feet and wheels. The angular edged projections give increased traction and safety. There are no corners or pockets to trap dirt or liquid making it easy to keep clean. The overlapping projections reinforce one another giving extra stiffness and strength. They also match when laid side to side or end to side reducing installation costs.

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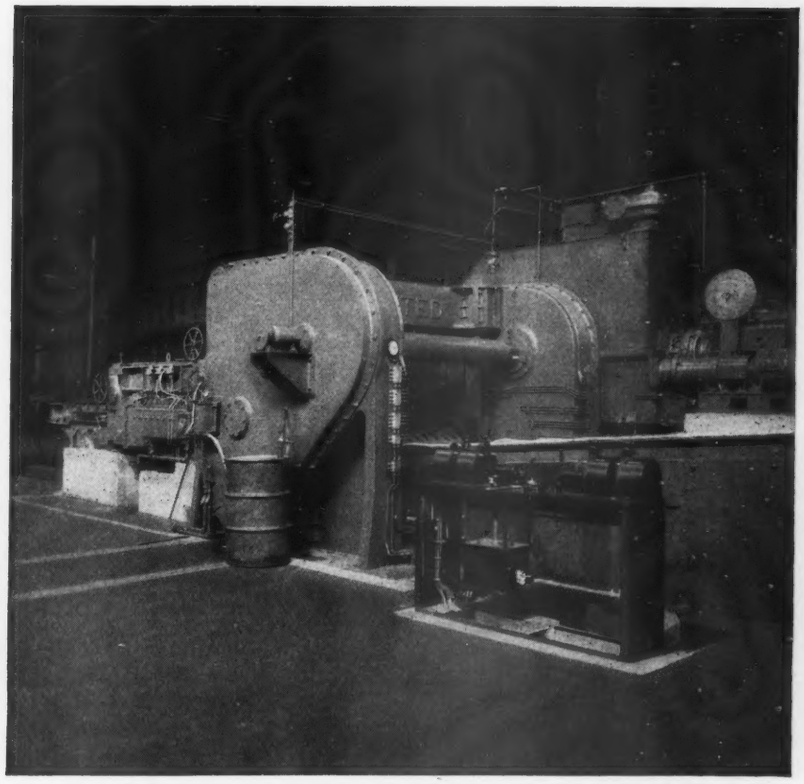

• When a starved bearing *"groans"* and runs a high temperature, shut-downs and lost production invariably follow.

Outage time for bearing repair is rarely due to the kind of oil used, but more often because at some time, some of the bearings don't get any.

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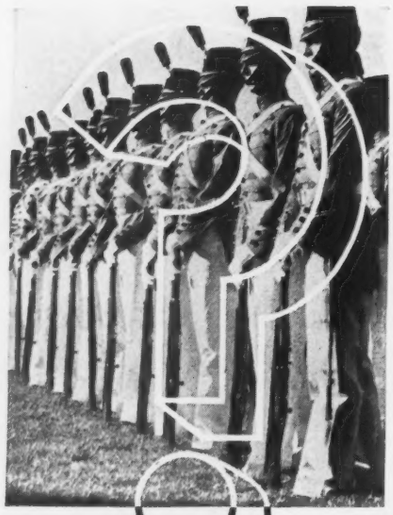
Special Delivery to Every Bearing



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Shipments reinforced and secured with Signode Tensional Steel Strapping pass these critical inspections with flying colors . . . assure you of tight control of the product from plant to customer . . . arrive at destination just as they were packed.

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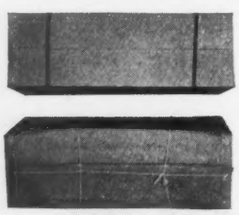

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to the preference of the others. It did, however, stand upon its insistence that the court reporter take down the proceedings, though acceding for some informal, off-the-record conversation before recording should begin.

It was plain that both sides had undergone a change of mind since the last meeting's abrupt termination. The union men were more conciliatory, perhaps because of the very evident sentiment among employees and townspeople against the strike. The management representatives were less inclined to balk at signing, perhaps because of the equally evident fact that it was quibbling to be willing to post a statement of company labor policy on a bulletin board over the name of the president, and yet to be unwilling to sign that same set of policies as an agreement with the representatives of some of its employees.

Rioting Breaks Out

So, after an amount of talking for the record which on analysis looks like face-saving by both sides, it was agreed to change a few unimportant words so that the statement of labor policy would be in the form of an agreement rather than merely a unilateral document, and then have it signed by both sides.

While some of the less significant of the union representatives were indulging in talk about specific grievances which obviously belonged anywhere except in a meeting of this nature, the only really violent rioting of the entire strike broke out in the street outside the office window, where everybody present could see it, and could see a man bleeding rather freely. At this, two members of the management group tore into the union group for wasting time and permitting such things to occur, while they talked about trivialities. Dernoncourt sided with the executives, the remaining provisions of the company's statement of labor policy were accepted with a few hundred words of brief discussion, the union committee asked for a recess, and the management group withdrew to give them privacy.

During this recess, Vice-President Holt had the agreement typed as negotiated, which was addressed to the local of the union, with a half dozen words to mutualize the agreement. Immediately after the recess, all members of the union committee signed for the CIO and President Heacock signed for the company.

Immediately Dernoncourt and

(*Continued on page* 154)

WIRE

Round—Flat—Half Round
Straightened and Cut
Shape Wire

HIGH CARBON SPRING
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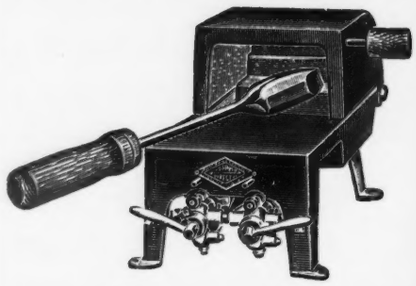

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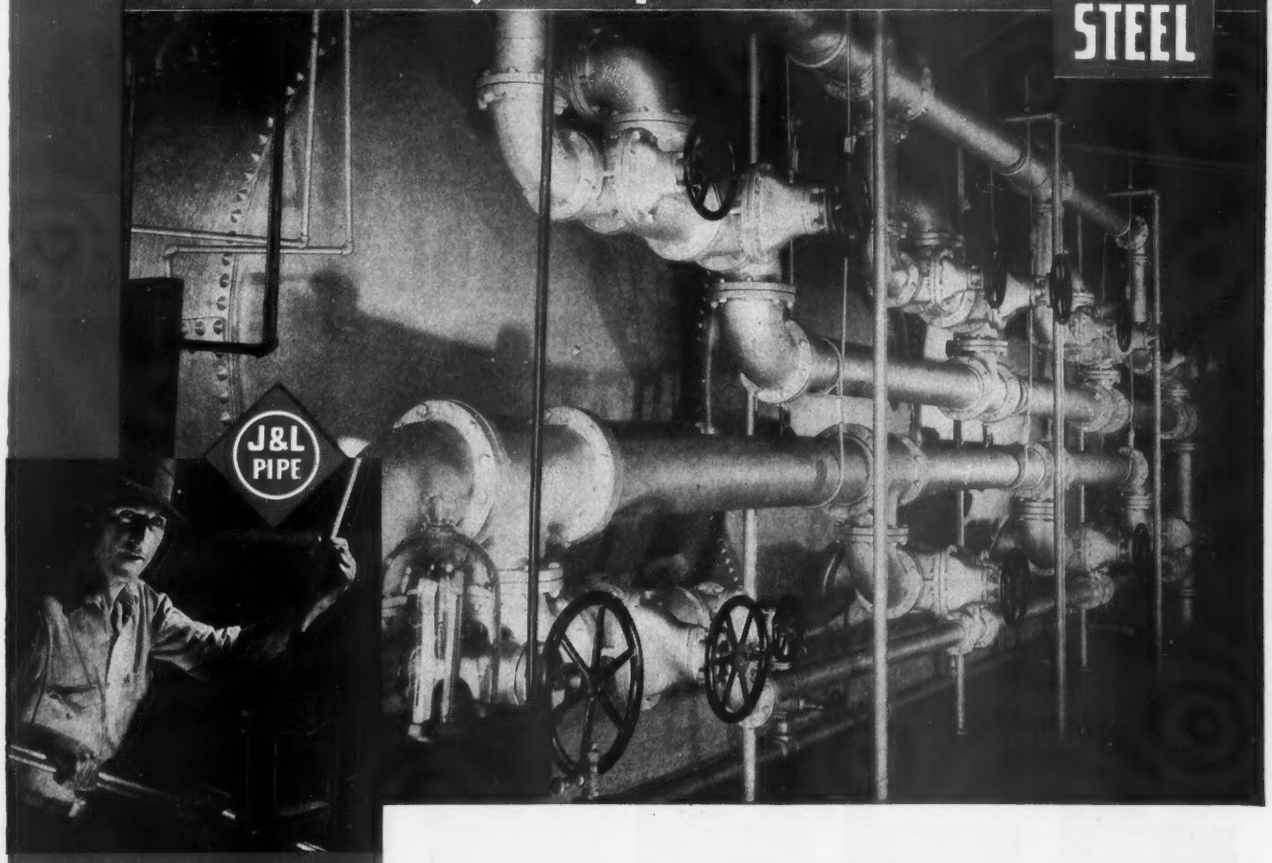

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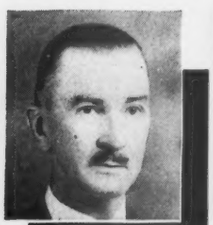

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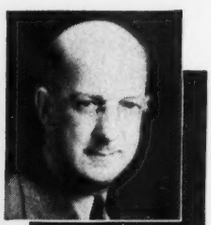

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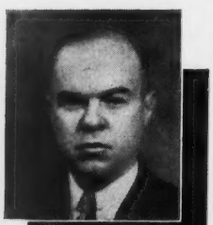

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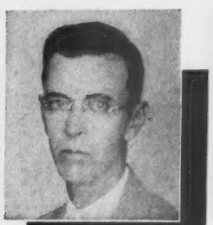

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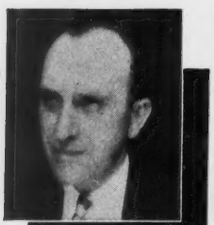

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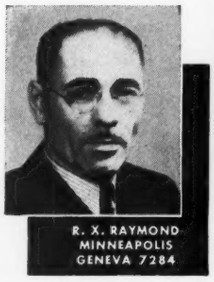
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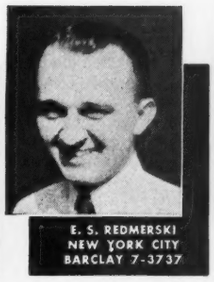
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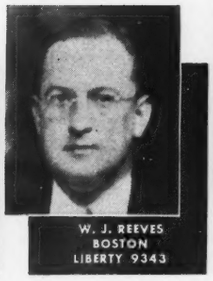
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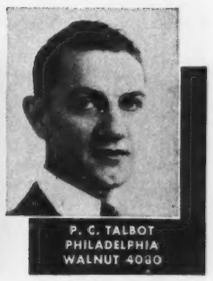
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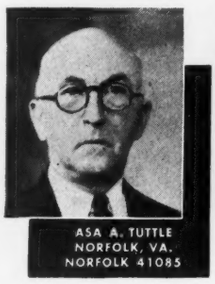
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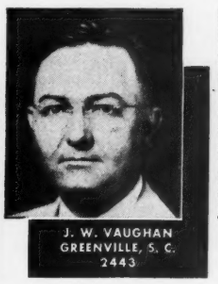
NORFOLK 41085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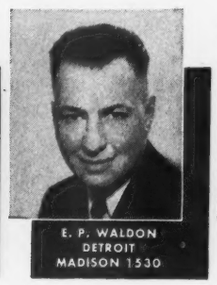
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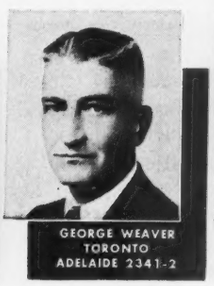
MADISON 1530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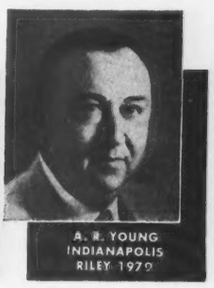
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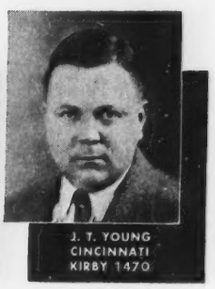
RILEY 1970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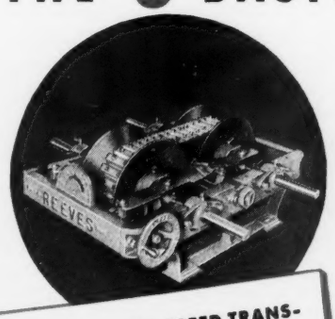

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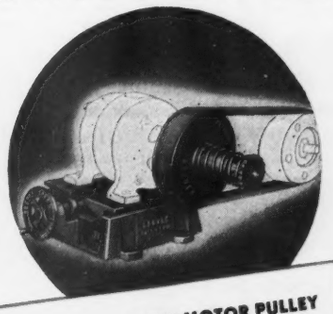

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The brush loosens the dirt and dust. Spencer Vacuum takes it away. Special tools for all surfaces and more than a hundred special applications in industry.
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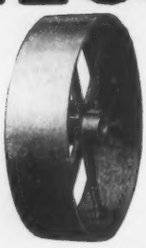

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MEMBER: The Mechanical Power Engineering Associates.

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(*Continued from page* 150)

company officials went to the scene of the sitdown and notified the men the strike was over. Dernoncourt called off the outside picketing. The union held a "Victory Celebration" in honor of getting the company's signature to its previously posted statement of labor policy. Everybody went back to work on the next Saturday to catch up part of the possible shift, and the plant worked lost production. The only person not restored to status as an employee was the sitdowner—at first the leader, but subsequently reduced to the ranks by his fellows—guilty of slugging two supervisors.

Conference in California

In the following month the same general sort of conference for negotiation was held at the San Leandro, Calif., plant of the company. This time, however, it was the International Association of Machinists, an AFL local, which was asking for the agreement, and CIO men were opposing any such agreement. The meeting was much longer than any of the Peoria conferences, because it settled at one sitting what had taken three meetings to accomplish at Peoria. The company signed with the AFL at San Leandro almost the same agreement as was signed with the CIO at Peoria. Subsequently it has signed at Peoria the self-same contract with the Alliance, a union independently organized by Caterpillar employees outside any other groups.

The history of the Caterpillar labor relations to date may be summarized in a very few sentences. As this is written, early in August, there have been no interruptions of work of any kind. A few grievances have been brought up for negotiation by the CIO union, and a few by the men independently. All of these have been settled—apparently to everyone's satisfaction—in the factory organization, without any of them being appealed up to the general management level.

The Peoria labor situation looks tranquil, both on the surface and by what can be seen of what goes on underneath. There is little evidence of any strength of CIO membership in Caterpillar, or of dissatisfaction in Caterpillar worker ranks. The townspeople, and those in neighboring communities, unite in believing rather generally that Caterpillar was entirely fair, that it leaned over backward to be patient, that the strike was unnecessary and unwarranted.

The consensus is that the union

Westinghouse motors give more "mileage" too!

THEY HAVE RIGID ONE-PIECE FRAMES

The constant turning, twisting surge of power from a motor shaft requires a rigid one-piece frame to maintain accurate alignment of electrical parts. This alignment is provided in Westinghouse CS Motors by the RIGID ONE-PIECE FRAME.

Moreover, Westinghouse combines with this great feature the *plus* values of SEALED SLEEVE BEARINGS and DUAL-PROTECTED WINDINGS with *taped end-turns*. In no other motor will you find *all three* of the necessary fundamentals for More Motor Mileage. For complete information, call your nearest:

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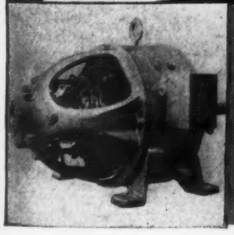

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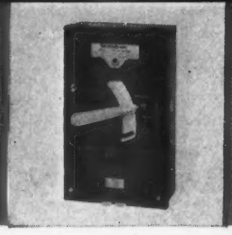
Industry's most popular general-purpose direct-current motor.

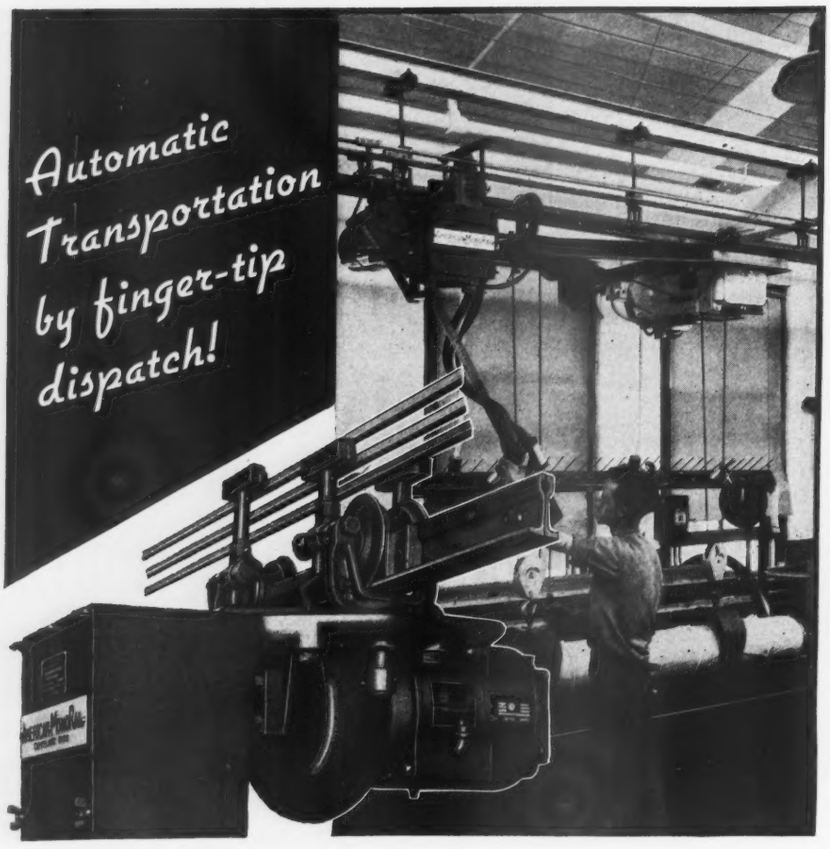


NOFUZE "DE-ION" CIRCUIT BREAKERS

banish fuse renewals, protect circuits with minimum maintenance, maximum safety.

SAFETY SWITCHES

The exclusive Westinghouse diamond-pointed jaw construction multiplies contact life.



Loads as heavy as three tons are now dispatched for automatic transportation over monorail systems by means of the American MonoTractor.

This rubber wheel drive unit successfully propels hoists, carriers, and cranes at speeds up to 300 feet per minute.

It operates through track switches, up 10% grades, over scale or lift sections with local or remote control or completely automatic from central control panel. Some loading and unloading operations are also performed automatically.

For a complete labor saving system, the American MonoTractor is indispensable. Engineering service furnished without cost. Complete information will be sent on request.

AMERICAN MONORAIL CO.

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obtained utterly nothing by getting the agreement signed, since its members already had all of the privileges guaranteed to them. And Caterpillar is still regarded rather generally, among both other townspeople and its workers, as a top-notch employer of whom the town should be proud.

This article is intended as a succinct case study, not as occasion for editorializing on labor policies. It may not be amiss, however, to point out some of the more prominent factors which entered this equation:

1. A long record as a good employer.

2. Absolutely public negotiation at company behest.

3. A written record of proceedings, to prevent misunderstandings.

4. Placing this record in the hands of all employees and other interested individuals right on the heels of the meeting itself.

5. A definite statement of company labor policies, specific enough to permit of very few ambiguities.

6. Willingness to sign this agreement addressed to any organization, union or otherwise, which is authorized to represent employees.

Sometimes Conciliators Can Settle

(*Continued from page* 55)

business and little about the labor question or the union points of view and principles; they would not approach a new customer with as little knowledge of the subject as they have when they wade into labor troubles. And they are almost invariably asked the stock questions displayed herewith in bold type.

And, also, I know there is an inevitable question: How can the Department or a Commissioner be neutral under the provisions of the organized law by which it is their function for the wage earners "to advance their opportunities for more profitable employment?"

The answer is almost elementary in these days when every intelligent employer knows that our prosperity depends upon our national purchasing power, and that the purchasing power rests upon the wages paid. Higher wages mean prosperity—from 1922 to 1926 proved that. The neutrality of the Department and its Commissioners consists in knowing what neutrality is and what

Another Advance—

in SAFER and LOWER COST
Maintenance of Lighting Equipment

BENJAMIN
FLOOR-SERVICE
TURNLOX

A New Optional Turnlox Feature which eliminates the use of the hazardous, time-wasting ladder in many locations. Costs but a few cents more than regular Turnlox Equipment.

Turnlox and now Floor-Service Turnlox! Two Benjamin developments, each with a definite place and purpose in the solution of the all-important maintenance problem.

Dirty reflectors and inefficient lamps can waste up to 80% of their rated efficiency. Frequent cleaning and inspection is therefore just as important to Right Lighting as the installation of the right type of lighting reflectors.

To simplify maintenance, minimize production interruptions, and reduce maintenance costs, Benjamin originated the Turnlox hood construction. Turnlox made it possible to remove the reflector and lamp as one unit for easy cleaning *on the floor.*

Now comes the Benjamin Floor-Service Turnlox to make possible the safe and easy removal of the reflector and the lamp as one unit *from the floor.* All of the familiar Turnlox advantages are retained. Floor-Service Turnlox units differ only in their bell mouthed hood construction.

Standing safely on the floor, it takes but a moment for the maintenance man to clamp the Benjamin Floor-Service Reflector Changer to the reflector rim. He then exerts a slight upward pressure on the changer shaft and turns left a quarter turn to remove or right to replace.

Quicker and easier, Benjamin Floor-Service Turnlox thus lowers maintenance costs, eliminates production interruptions and accident hazards in the servicing of reflectors mounted up to a height of eighteen feet.

Complete details and information concerning Turnlox reflectors available with the optional Floor-Service feature at a very slight increased cost may be had by writing or returning coupon to Benjamin Electric Mfg. Co., Des Plaines, Illinois.

Benjamin Turnlox Reflectors available with the Optional Floor-Service Feature—
Turnlox RLM Dome Reflectors . . Turnlox Flat Cone Reflectors . . Turnlox Shallow Dome Reflectors . . Turnlox RLM Bowl Reflectors . . Turnlox Glassteel Diffusers . . Turnlox "Silvered Lamp" Diffusers . . Daylight Globe "Turnlox" Glassteel Diffusers . .
Also available are several of the Benjamin standard Mercury Lamp reflectors. Present Turnlox Installations of above reflectors may be converted into Floor-Service Equipment by a simple change in reflector hood.

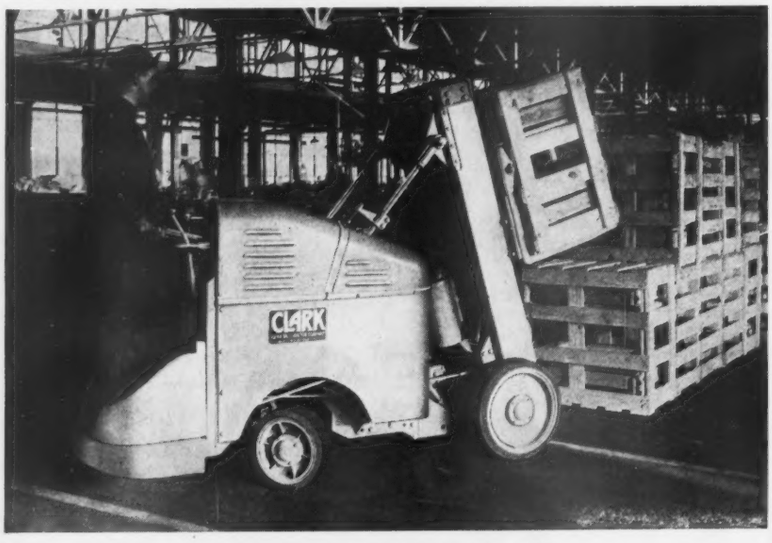
The UNSUSPECTED ROBBER

in industry is inadequate lighting. Its elimination results in (1) Conservation of workers' eyesight; (2) Increased personal efficiency and health of employees; (3) Fewer Accidents; (4) Less Rejects and Spoilage; (5) Reduced Labor Turnover; (6) Smoother, more efficient operation.

Benjamin Electric Mfg. Co.
Des Plaines, Illinois

Send complete catalog details on the new Benjamin FLOOR-SERVICE TURNLOX

(Write your name and address in margin below.)



CLARK "TRUCTIER"

Note the position of the rear wheels of this Clark 3-ton "Tructier"—that means short turning radius—the ability of a powerful lifting, carrying and tiering machine to wiggle through tortuous aisles, around sharp corners.

This is just one of 50 modern machines designed to speed production and described in the new Clark catalog. Ask for a copy.

CLARK TRUCTRACTOR
Div. of Clark Equipment Co.
BATTLE CREEK, MICHIGAN

Direct Gas Powered
—always. Since 1917

Profits when Belts will Slip Don't Grip

Renew the old belt's grip and prolong its life with Dixon's Belt Dressing. Two proven forms are available:

DIXON'S SOLID BELT DRESSING—the old favorite red-labelled giant bar (8" long, 2" diameter) prevents belt slip, preserves belting life. It's easy to apply to running belts. The cardboard cylinder which encases the stick is readily peeled off as the dressing is used. There is nothing better for leather, rubber and composition belts.

DIXON'S PASTE BELT DRESSING for leather belt and manila rope drives waterproofs the belt, restores and maintains belt cling, by keeping the belt pliable—all without imparting a sticky, dust-catching surface. Nothing else like it for manila transmission ropes—keeps the fibres flexible, increases traction, waterproofs, prevents rotting.

Applied with a paddle or brush to running or idle belts, from collapsible tubes or from cans. At all dealers. Write for booklet 0-44.

JOSEPH DIXON CRUCIBLE CO. JERSEY CITY NEW JERSEY

DIXON'S Solid BELT DRESSING

SEND FOR CIRCULARS

7661

it is not; this is more than either of any two contestants can know. Its function is to balance a scale, sometimes its weight on one side, then on the other; or, in another way, like that of a chemist who neutrally inspects the ingredients offered. Every employer wants high wages, the higher the better, for every line but his own—so that wage earners can use more of his products. The Department can assist in aiding neutral balance in the present chaotic discrepancies in the wage field and avoid the frictions for all except those who prefer to play the game without rules—or with only those they themselves make.

Industry Must Do Something About Its Syphilis

(*Continued from page* 63)

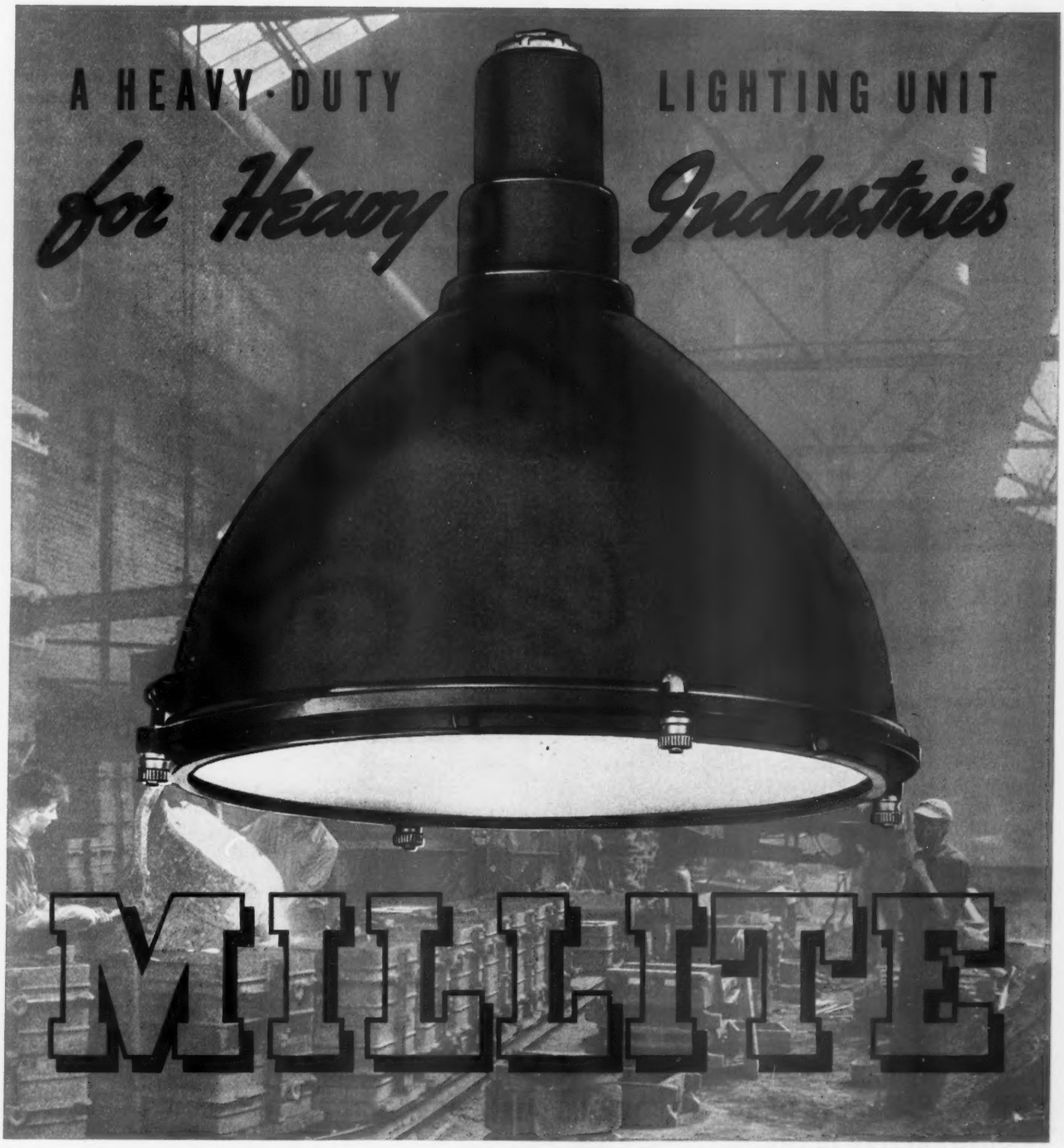
surgeons. The subject was under repeated discussion by the medical section of the American Railway Association; that section drew up a definite venereal disease control policy for the industry in 1926.

One large industrial organization, the E. I. duPont de Nemours & Company, has made a major start in doing something about syphilis. A review of its work will provide an effective introduction to a discussion of syphilis control in industry. Dr. G. H. Gehrmann, duPont medical director, described his program some months ago in a paper printed by the United States Public Health Service.

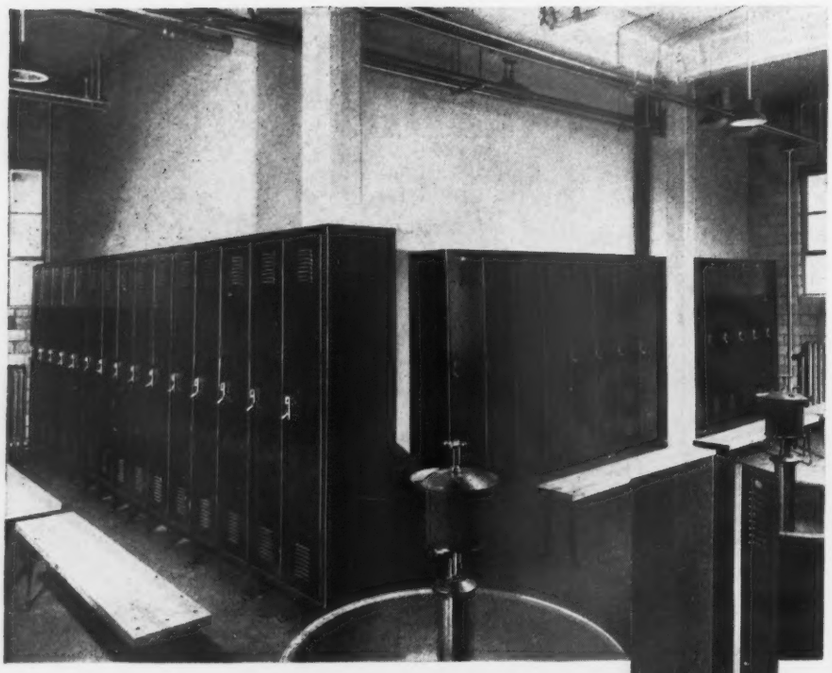
Here was an industry which employs nearly 37,000 workers in seventeen States. It augmented its medical service in 1934 by addition of a central serologic laboratory for the taking of routine blood tests for syphilis infection. The blood test is basic in the diagnosis of syphilis.

"All new employees and as many old ones as would voluntarily submit to the test were examined," wrote Dr. Gehrmann. "Less than 10 per cent of the old employees refused the test. In all, 36,794 employees have been examined and 1,488 or 4 per cent found positive. . . . Positive tests have been checked with a second test and by . . . tests done by an independent laboratory." There is nothing more imperative in dealing with syphilis than that no false diagnosis of syphilis be made.

Results of blood tests are confi-



Here is the new lighting unit Industry *asked for!* Millite provides maximum lighting efficiency in high-bay areas under severest atmospheric conditions. Mechanically rugged, the new Millite is equipped with a special high tension lens that withstands extraordinary impact. This lens is also impervious to sharp temperature changes. *For a new folder on Millite* call your local Westinghouse Jobber Lighting Specialist. Or address the Westinghouse Electric & Manufacturing Company, Lighting Division, Edgewater Park, Cleveland, Ohio.



LOOK AT THE CONSTRUCTION OF A-S-E LOCKERS

—and Judge for Yourself

Subject A-S-E lockers to the same careful analysis that you give other plant and office equipment. Inspect their unusually sturdy frame construction, the doors that will flex without distortion, the bottoms that will hold a man's weight, and all of the other points of vital importance to the satisfactory selection of lockers.

A-S-E
Single Tier Locker

A-S-E
Double Tier Locker

You will easily recognize the extra value which A-S-E lockers represent and understand why they are able to give years of trouble-free service, successfully withstanding the effects of hand use.

A qualified A-S-E engineer will be glad to demonstrate the strength and durability of A-S-E Lockers—suggest the type of locker best suited for *your* requirements or the most practical solution of the placement problem. There is no obligation.

NEW A-S-E-UNIT-ROBE — PROVIDES MAXIMUM ACCOMMODATION IN MINIMUM SPACE

The Unit-Robe, an A-S-E group locker especially designed for industrial use, establishes a new record in locker economy. It will accommodate 16 persons in approximately one-half square foot of floor space per person. Individual box lockers, 12 inches wide, 18 inches deep, 12 inches high are provided for each person. Outer garments may be hung, full length, on the coat hanger rod below the horizontal section. It is easily erected and moved—no upkeep costs. Mail coupon for complete information.

A-S-E Unit-Robe

All-Steel-Equip Company, Inc.
501 Kensington Ave., Aurora, Ill.

Please furnish, without obligation, complete information about A-S-E Lockers.

( ) Have an A-S-E engineer call
( ) Mail locker catalog C-30
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Name .....
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City ..... *State* .....

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501 KENSINGTON AVENUE
AURORA, ILL.

dential between the employee and the medical division. Applicants are not rejected, employees are not discharged when syphilis is discovered, provided they will take treatment that will protect their fellow-workers from infection and themselves from future complications of the disease. Only food handlers, employees exposed to lead compounds, or employees already suffering from late manifestations of syphilis, are exceptions to this rule.

No treatment is given. The company's work is limited to these two functions: (1) Taking the blood tests and verifying their accuracy; (2) medical "follow-up" to see that every man in need of treatment gets prompt and adequate care. The follow-up involves instruction in the nature and significance of the disease. Faithfulness to the long routine of treatment is not to be expected unless the syphilitic understands his own problems as thoroughly as the diabetic is trained in the idiosyncrasies of his diet. The duPont experience may be regarded merely as one case record in the development of industrial syphilis control.

Railroads Use Blood Test

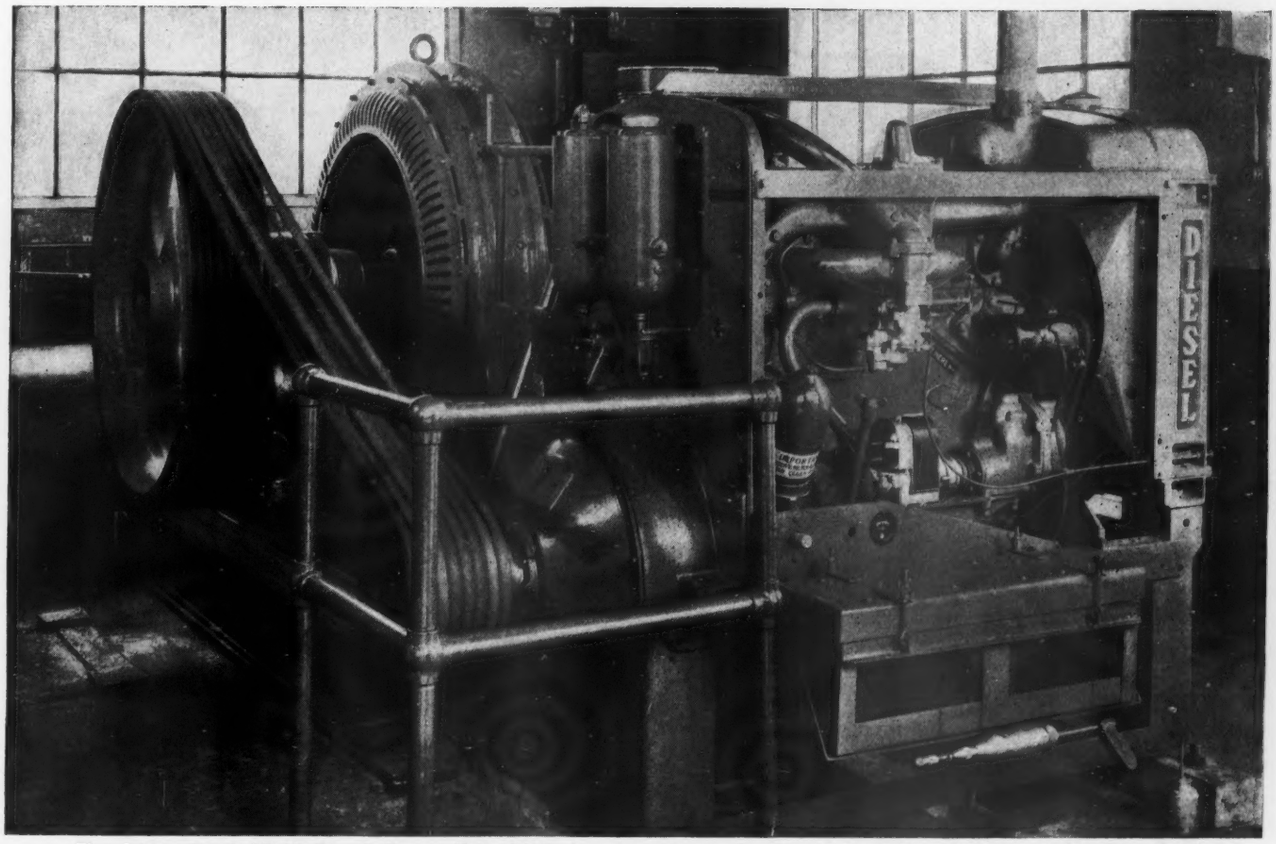
Efforts have been made recently by the United States Public Health Service to find out what other industrial medical services were doing to control venereal disease. The questionnaires returned to date do not provide enough information for broad generalization about the work and policies of American industry in this field.

These tentative results may, however, be stated. Railroads, with their interest in safety, still lead in the proportion of companies that conduct blood tests and in the total number of employees examined. Approximately 10 per cent report that blood tests are a routine part of the physical examination of applicants. Sixteen per cent report that the test is performed as a part of the re-examination of employees.

Fifteen roads, which employ 414.684 of the 1,013,000 railway employees, have tested 119,535 of their workers. One hundred and fifty miscellaneous business establishments have tested 150,000 employees and applicants.

Three railroads reported that all their employees had been examined. Half a dozen other roads reported upward of 30 per cent of their workers had been tested. One railroad has examined more than 45.-000 workers; another has examined

INTERNATIONAL ENGINES
Cut Power Costs



The International PD-40 Diesel Power Unit driving a generator in the plant of the Ballard Silk Co., Binghamton, N. Y.

These engines are the product of International Harvester, and are backed by this Company's world-wide reputation for *quality* and *after-sale* service. They have seen action in almost every conceivable kind of work and condition throughout the world—thoroughly tried and tested from every standpoint.

The *sound engineering* of every detail in International Engines shows up to advantage on the job. On many kinds of work they have the ability to provide a *smooth flow of dependable power* twenty-four hours a day for month after month and year after year.

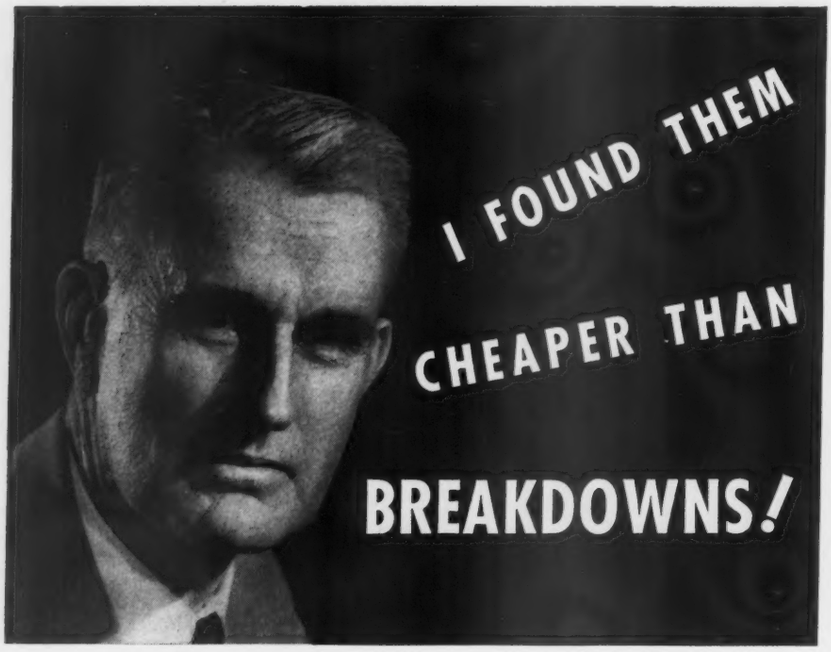
The *economy* of International Engines is readily apparent in the cost records of their users. And this goes for *economy of maintenance* as well as of operation. They are built to be serviced *fast, easily,* and at *low cost.* And no matter where they work, factory-standard service is always nearby.

The International line ranges up to 110 max. h.p. It includes 4 and 6-cylinder engines for gasoline, distillate, or natural gas, and 4 and 6-cylinder Diesel engines. Where more power is needed for peak loads, multiple installations of these engines work out successfully.

International Engines are available in compact power units; in International Industrial Tractors (wheel and crawler types); and as the power for a variety of equipment built around them. See the nearby industrial power dealer or Company-owned branch for complete information.

INTERNATIONAL HARVESTER COMPANY
(INCORPORATED)
Harvester Building **Chicago, Illinois**

INTERNATIONAL Industrial Power



Sharp pencils everywhere prove that *the best is the cheapest* "in the long run." Maintenance men are putting an end to costly production interruptions and equipment failures by replacing with dependable Faultless Casters. More metal is used to give them surplus strength —double rows of hardened steel Ball Bearings assure easy-swiveling —Hyatt Roller Bearings in the wheel eliminate needless tax on workers' strength.

All Faultless Casters are tested products, proved to deliver extraordinary service *more economically*. No matter what your caster problem—whether for trucks or assembly lines—you'll find a way to cut mileage costs in your copy of our OD Catalog, available for the asking.

No. 200 Series Heavy Duty Double Ball Bearing Swivel with Semi-steel Hyatt Bearing Wheel.

FAULTLESS CASTER CORPORATION, Dept. FM-9, Evansville, Indiana

Branches in Principal Cities. Canadian Factory: Stratford, Ontario.

FAULTLESS CASTERS FOR INDUSTRY

20,000; another 16,000; another 8,000.

The proportion of syphilitic infections revealed by these tests is 6 per cent for the railroads, 5 per cent for the miscellaneous classification.

Data Is Fragmentary

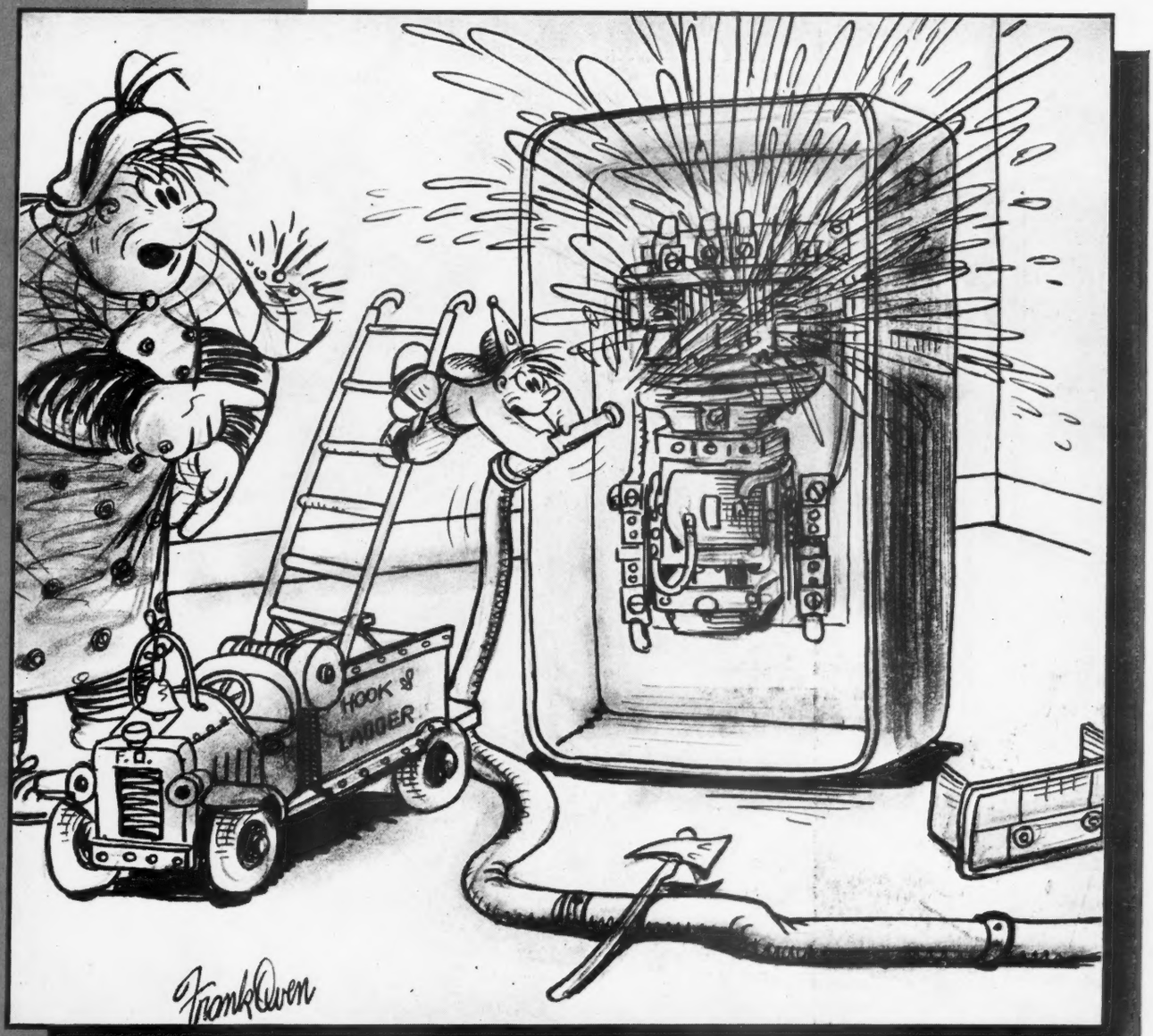
Data on the policies followed is too fragmentary to be set down here as a fair sampling. Moreover, policies in carrying out these programs are only now being formulated for most of industry. The Public Health Service is asked to confer frequently with industrial concerns on this problem. Our suggestion to them is given in terms of modern knowledge of the disease and the practices of the more advanced industrial programs. The following points might summarize our present attitude:

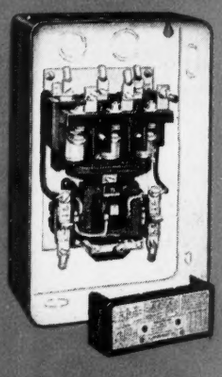
1. Blood tests should be a part of the applicants' physical examination at the time of employment. The return of a positive result may justify a short delay in employment until treatment is begun and the infectious stage is passed. It should *not* be ground for the rejection of the applicant. Syphilis to modern medicine is just another communicable disease; and it is more definitely curable than most serious diseases.

2. Blood tests should be a part of routine physical examinations. Treatment may properly be insisted upon, especially in jobs hazardous to the worker or to others. In this case, however, a responsibility rests upon the medical examiner to see that proper care is available from a private physician, a public clinic, or the industrial medical service, at a fee well within the employee's ability to pay.

In dealing with either applicants or employees, a policy of rejection or discharge will serve principally to drive the cases underground, to replace the recently broken moral taboo with a good economic reason for secrecy. If such a policy became general, it would send all syphilitics to the public relief rolls, and deprive them of the income upon which their ability to take treatment would depend.

Moreover, as Dr. Joseph Earle Moore of Johns Hopkins Hospital has written recently, "The paretic executive is perhaps more likely to do harm to the affairs of the company than the comptometer operator or the common laborer with latent syphilis. . . . If the laborer is to be fired solely because he has syphilis,





Bulletin 709 automatic solenoid type starter with arc hood removed to show the contacts.

"Stop, Philbert! There isn't any fire up there!"

This is one on Philbert! He didn't know this was an Allen-Bradley solenoid starter, which doesn't flash and flame like other starters. Arcs that form are immediately extinguished. Double break contacts cut the voltage in two—cadmium silver contacts deionize the arc—totally enclosed arc chambers snuff it out. That's why Allen-Bradley solenoid starters easily disrupt currents of not less than ten times their maximum horsepower rating, without burning, blistering, or welding the contacts.

The double break, silver alloy contacts on Allen-Bradley solenoid starters must never be cleaned or filed! They are always in first-class operating condition. Any oxides that may form on these silver alloy contacts will conduct current just as well as the contact metal itself.

ALLEN-BRADLEY

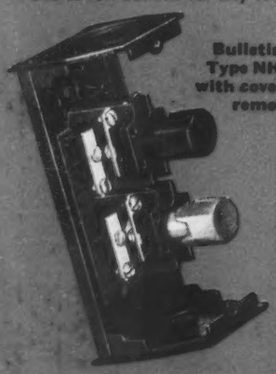
SOLENOID MOTOR CONTROL

NEW!

BULLETIN 800

Heavy Duty Push Button Stations

The push button mechanism is of the unit type with double break, silver alloy contacts. It can be arranged in combinations of from one to ten buttons for any service.



Bulletin 800, Type NH-1010 with cover plate removed.

Surface mounting stations have an attractive, black enameled, pressed steel enclosing box with multiple knockouts. Removing the front cover exposes both the front and sides.

Cover of Bulletin 800, Type NH-1010.

Send for New Bulletin 800

Allen-Bradley Co.
1321 S. First St.
Milwaukee, Wis.

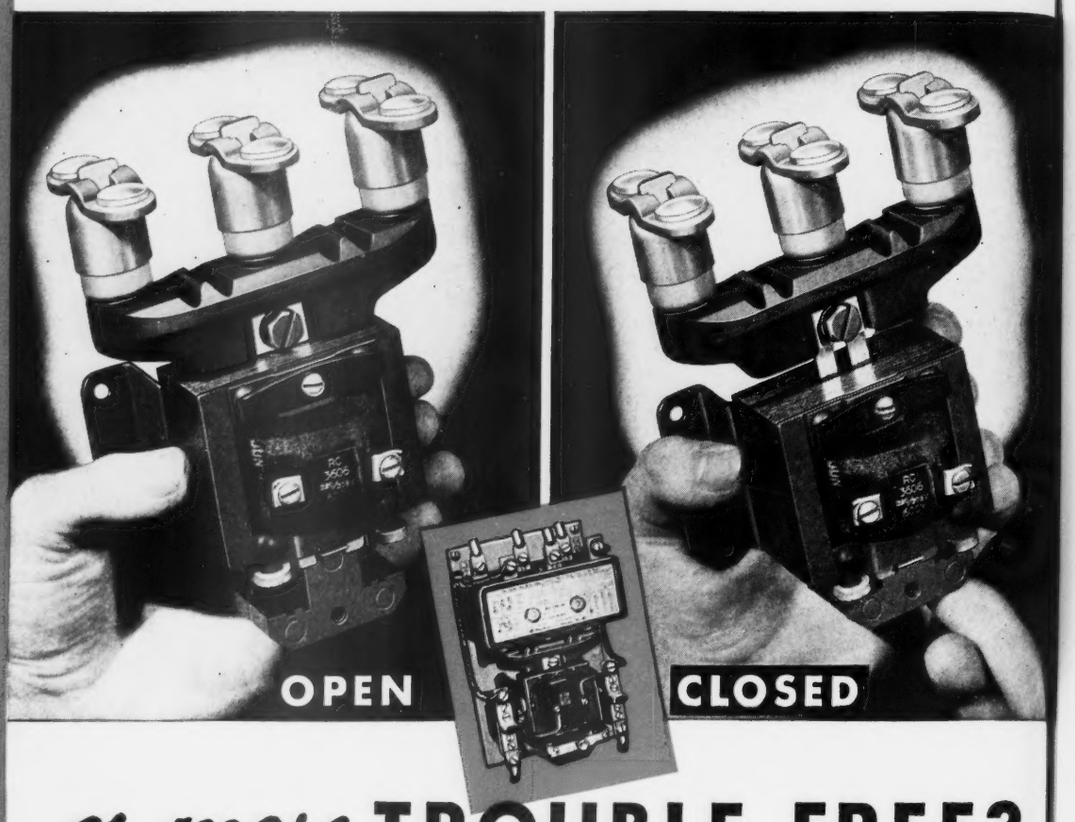
Please send me Bulletin 800.

Name.....

Firm.....

Address.....

What could be simpler



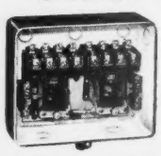
or more TROUBLE FREE?

No pivots—no pins—no bearings—no complicated mechanism—just a direct connection from the plunger to the contacts. That's the secret of the Allen-Bradley solenoid starter's trouble-free performance. Wear, dirt, or corrosion cannot interfere with its smooth, frictionless operation.

Not only is the Bulletin 709 solenoid starter the most simple starter on the market, it is also the most compact. Nevertheless, all Bulletin 709 starters will easily disrupt currents of not less than ten times their maximum horsepower rating. The double break, silver alloy contacts on Bulletin 709 solenoid starters never need filing. Hence, these silver alloy contacts outlast many ordinary copper-to-copper contacts.

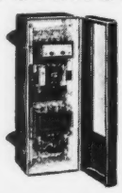
Note the generous wiring space, white enameled cabinet interiors, front-of-panel wiring, accessible terminal connections, removable cabinet covers, and the many knockouts on Allen-Bradley solenoid starters. Then you'll see why installation and inspection of these starters is so simple. Write for the latest Allen-Bradley booklet, "The Story of the Solenoid Starter."

Other Allen-Bradley Solenoid Starters

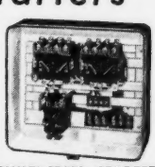


REVERSING SWITCH
Bulletin 705 solenoid reversing switch. The contactors are mechanically interlocked.

COMBINATION STARTER
Bulletin 712 combination automatic solenoid starter and disconnect switch.



RESISTANCE STARTER
Bulletin 740 automatic resistance type starter.



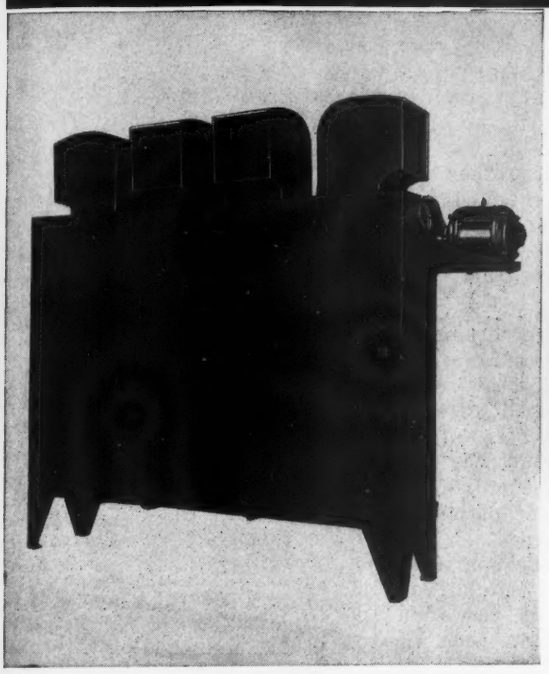
MULTI-SPEED STARTER
Bulletin 715 automatic solenoid starter for multi-speed motors. No back-of-panel wiring.

A-B Allen-Bradley

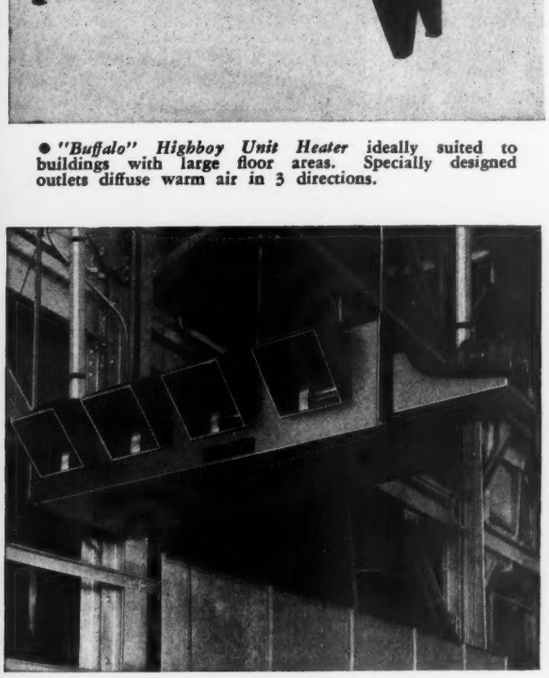
ALLEN-BRADLEY
SOLENOID MOTOR CONTROL

Reduce Your Heating Costs

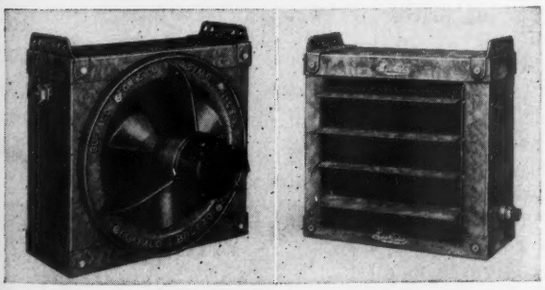
with "Buffalo" UNIT HEATERS



● *"Buffalo" Highboy Unit Heater* ideally suited to buildings with large floor areas. Specially designed outlets diffuse warm air in 3 directions.



● *"Buffalo" Flat Suspended Lowboy Unit Heaters* are also recommended for buildings having large floor area. This type is recommended where all available floor space is required for production or other plant operations.



● *"Buffalo" Model "B" Breezo-Fin Unit Heaters.* For smaller working areas or wherever warm air is needed in special locations, we recommend the Breezo-Fin. Has adjustable louvers and its heater elements are suitable for steam pressures from 2 lbs. to 250 lbs.

Warm air just where you want it, when you want it becomes a simple matter when you install "Buffalo" Unit Heaters. Our wide experience in solving the heating problems at a new low cost for many industrial plants enables us to give you valuable aid and assistance in solving similar problems.

How to Select the Right Size and Type

Our new bulletin No. 3050 not only illustrates and describes the many sizes and types we manufacture, but in addition gives much other valuable information, B.t.u. capacity Rating Tables, installation suggestions, etc. It will help your own engineering department to solve your heating problems in the most efficient and economical manner.

Write for it today. It will help you to be fully prepared for the cold weather ahead.

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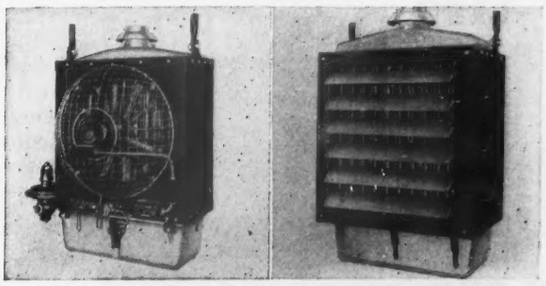

● *"Buffalo" Gas Unit Heaters* are recommended wherever natural or artificial gas is readily available. Heaters are fully automatic and are equipped with every necessary safety device.

BAGS, BARRELS, BOXES, BALES, ROLLS *or what have you?*

THE size, shape or weight of the units you handle makes little difference when you use a Colson Lift Jack System. All can be moved at minimum cost for handling—with no extra pick-ups or extra set-downs.

Two simple, long-enduring units do the trick:

1. A platform or live skid with wheels on one end and legs on the other.
2. A twin-wheeled jack that engages the front end of the platform and converts it into a sturdy, easy-to-roll truck.

Loads as much as 3,000 to 4,000 pounds per truck are then readily transported—every load is instantly mobile.

INEXPENSIVE, TOO

Another remarkable thing about the Colson Lift Jack System is its low cost. As little as $150 will buy a Colson Lift Jack and several platforms—no other equipment is needed. Write for booklet "Colson Materials Handling System" that gives complete information.

THE COLSON CORPORATION
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Colson

LIFT JACK SYSTEM

35 to 50 bags of sugar—100 pounds each—in and out of storage with minimum handling.

so should the syphilitic executive as well."

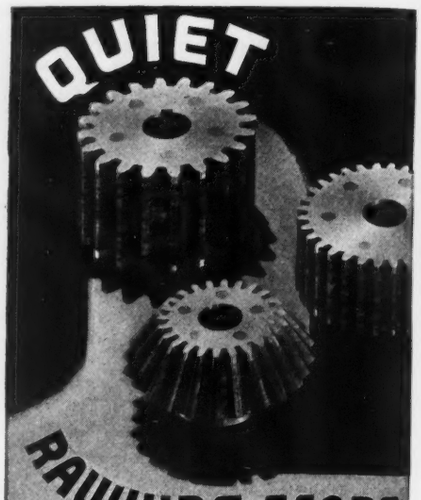
3. A thorough educational campaign which will give employees in general an understanding of the problem of the disease is a contribution that industry is well equipped to make. The factory group is relatively homogeneous. Syphilis will not be conquered until we face it in the same systematic way we face an epidemic of any other disease. Similarly, the infected person must receive the same initiation into the problems of his disease that a diabetic gets into his diet peculiarities.

4. In line with the best practice of industrial medical officers, the privacy of the medical officer's findings should be maintained so far as possible as a matter between the medical department and the employee. Most states ask only for a number or initial of the patient so long as he takes treatment.

5. There is another field in which industry may make a special contribution. Blood tests, case finding, and treatment have been the objectives of the educational campaign carried on by public health and medical authorities thus far. It is the correct emphasis for a nation in which more than 1,100,000 cases of syphilis—early cases and old—report for treatment every year. The first step in control is to find current syphilitics and to cure them.

Prophylaxis in many ways is a problem for special groups. Education for the prevention of syphilis is approached differently among groups of young men, young women, college students, industrial workers, and military forces. It may be that industrial medical services, coming as they do in continuous contact with homogeneous groups, may make major contributions to medicine in education for venereal disease prevention.

6. Unless highly competent treatment can be arranged through private physicians or public, private, or part-pay group clinics, at prices ordinary wage earners can afford, industrial medical services should treat syphilis. Such treatment is being extended as part of regular medical service in some places, for the cost of drugs in others. There is a very real advantage to extending this service. Attendance at an industrial clinic is so routine that it gives rise to no great curiosity; it is so situated that little or no time need be lost from employment. Thus, maximum privacy and a minimum of inconvenience for the patient is



Meshed With Metal They Take All Wear

What "floating power" is to automobiles, what shock absorbers are to the chassis, Chicago Rawhide Gear and Pinions are to power drives. They end destructive vibration and chatter, silence "grinding" and take *all the wear* when meshed with metal gears. Dielectric—they prevent "grounds" and prevent accidents.

Available in all sizes, all types and all standard pitches.

Send for New Gear Catalog, showing metalic and non-metalic Gears.

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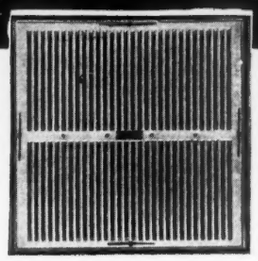
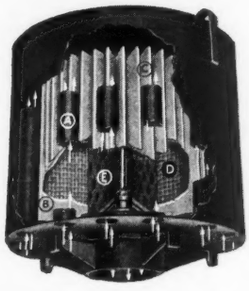
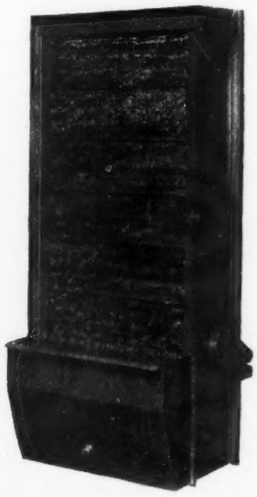
★ ★ ★ *Staynew Filter Corp.*
of ROCHESTER, NEW YORK



Panel Filter: 20" x 20" panels of 800 c.f.m. capacity. Can be bolted together to provide any required capacities. Feltex filtering medium in fin construction 99.9% efficient. Easily cleaned, long-lasting filters for general ventilation and engine protection.



Silencer-filter: Silences intake noise and prevents passage of abrasive dust to compressors and internal combustion engines. (A) Cylindrical rectifying tube (a series). (B) Dry Feltex Filtering Medium. (C) Radial Fin Construction. (D) Wire mesh frame. (E) Re-inforcing tube. *"It muffles the thump that hurts your cars."*



Automatic Impingement Filter: New Protectomotor development. Dust and foreign matter in air stream impinge on intermittently revolving curtains, *one* of which passes thru an oil bath. For general ventilation and engine protection where large volumes of air containing a high percentage of foreign matter must be handled most economically.

INDUSTRY is advancing on all fronts! More compressors, Diesels and gasoline engines are running "behind the lines". More drills, paint sprayers, air hammers—all the air driven tools—are in operation "up front". Be sure this valuable machinery is protected from abrasive dust with proper filters—*clean air saves you money.*

For every filter need consult the Staynew Catalog. More than 100 models, styles and sizes, exclusive of special designs.

Outstanding Firms Use Protectomotors

American Can Co.	Eastman Kodak Co.
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The Borden Company	General Motors Corp.
Chrysler Corp.	Metropolitan Life Ins. Co.
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Crosley Radio Corp.	Packard Motor Car Co.
E. I. du Pont & Co.	Standard Oil Co. of N. J.

Hundreds of other careful buyers have placed many repeat orders.

PROTECTOMOTOR
REG. U.S. PAT. OFF.
99 9/10 Per Cent EFFICIENT
AIR FILTERS

NEW! Acid, Alkali and Heat Proof Filter Medium.

Staynew Filter Corp.
14 Leighton Ave., Rochester, N. Y.
Please send a copy of your catalog.
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A Money Saving ROOFING SERVICE!

Carey ROOFING EXPERTS will give you a complete report FREE

Without leaving your desk, you may learn the exact condition of your roof. Just telephone a nearby Carey Approved Roofer for a FREE Inspection and Report.

If your roof is in good condition, you will be glad to know it. If weak spots are found, it's better to repair them now than to wait until leaks damage machines or materials.

No matter what type of roof your building has, this Inspection Service is Free — and does not obligate you in the least. If you do not know a Carey Approved Roofer, call the Carey Branch Office, today.

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Roofing . . . Flooring . . . Insulations . . . Roof Coatings and Cements
Waterproofing Materials . . . Expansion Joint . . . Asbestos Paper and Millboard

THE PHILIP CAREY COMPANY • Lockland, Cincinnati, Ohio
Dependable Products Since 1873
BRANCHES IN PRINCIPAL CITIES

A Chemically Inert Pigment-
A Water-Repellent Paint

Natural Flake Graphite is inert and water repellent. This same graphite, used as a paint pigment, possesses these desirable properties, adding to the effectiveness and life-span of the paint protection. Dixon's Silica Graphite Industrial Paints consist of natural flake graphite (water repellent and chemically inert), silica, mined with the graphite (adding hardness and specific gravity), and pure boiled linseed oil (the finest paint vehicle ever found).

The thin, flat flakes of the pigment plate the surface with a shingle-like armor that clings with utmost tenacity, sealing the protected surface against water, weather and inimical industrial gases. The result is a paint coat that will last nine or ten years where a paint-film life of two or three years would otherwise be considered good.

Paint all your exposed metal with Dixon's Silica Graphite Paints for greatest protection and lowest painting cost per square-foot-year.

Write for Master Specification No. B144 and color card showing the fourteen available colors, including aluminum.

Paint Sales Division
JOSEPH DIXON CRUCIBLE CO.
Established 1827 D X N Jersey City, N. J.

DIXON'S INDUSTRIAL SILICA-GRAPHITE PAINT

7662

Standards for Handling Incoming Materials

(Continued from page 68)

As a final operation all materials received via freight and express must be dispatched by truck to their respective destinations in the works. The effort required to perform these duties was found to be directly commensurate with the effort required to unload the cars and check express receipts.

With this information Curve No. 2 was plotted, from which the allowed time for dispatching is derived from the total allowed time for unloading cars and checking express. It should be mentioned that this dispatching is only in the central receiving station where carloads of mixed shipments are received. Most carload-lot material is unloaded at the storage point directly into stock so that no dispatching is required.

In summarizing, the following time values were the result of the above analysis:

Parcel Post and Express Receipts

Allowed Time per Week = .1650A + .0440B + .0305C + .1240D

Where A = total number of express shipments received
B = total number of parcel post shipments received
C = total number of parcel post returned material shipments received
D = total number of parcel post purchase shipments received

Freight Receipts

Allowed Time per Week = E+F+G

Where E = total allowed time for cars unloaded listed on Chart No. 1
F = total allowed time for cars unloaded listed on Curve No. 1
G = total allowed time for cars unloaded listed on Chart No. 2

Dispatching Freight and Express

Allowed Time per Week = allowed time derived from Curve No. 2

These values are applied by the timekeeper, the work requiring about four hours per week for approximately 500 hours of allowed time. This administration ratio is rather small considering the nature of the work and the improved performance attained through a rational incentive plan.

What do you want to Heat

TRANE

HAS A UNIT HEATER TO DO THE *Job!*

HAVE you a factory with hundreds or thousands of square feet of floor space or a packing plant, a garage, a shipping room, a shop, or an office, where you need quick, economical heat, with a minimum of equipment? Or have you added space, where you need heat, without changing over your present system? Trane has a Unit Heater, or a Unit Heater System, to match your problem, backed by thousands of installations and years of Unit Heater Development. Shown here are two types of Trane Unit Heaters. One is the new Trane Cradle Coil Heater with quiet 4-blade fan and special quiet mounting. The other is the rugged, powerful Trane Torridor, for special use where large areas are to be heated, for forcing warm air through ducts, or where outside air is introduced into the building.

Mailing the Trane-O-Gram will bring you new and valuable data on heating equipment that will solve your heating problem. Put it up to Trane.

Make the **TRANE** *Check Test Before You Buy!*

Trane Blower Type Unit Heater—most flexible and complete line of space heaters ever announced.

Trane's new 4-Blade Fan. Balanced and formed to eliminate noise due to air friction.

Trane Cradle Coil Unit Heater—low cost heating for office or factory

TRANE

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Heating · Cooling · Air Conditioning

TRANE-O-GRAM

The Trane Company, 2011 Cameron Ave., LaCrosse, Wis.

We need counsel on a heating problem.

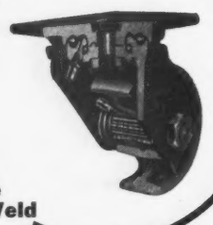
Company.....

Address.....

● When you see a heavily loaded truck gliding along the aisles with the skimming action of a Yankee Clipper under full sail . . . rounding sharp corners with the effortless ease of a swallow . . . ten to one it's rolling on Service Casters. For, silk-like smoothness characterizes Service Caster performance . . . under any load . . . or, on any floor.

Among the hundred-and-one forms of running gears on industry's indoor hauling equipment, these frictionless rolling units are unique. Because the bearing surfaces are multiplied, load drag, floor friction, and shocks are completely nullified. Hence the saving of effort . . . the prolonged usefulness . . . which make Service Casters supreme for low hauling cost. Demonstrate this fact for yourself on one truck, portable rack, or machine. Ask us to explain how easy and inexpensive it is to smooth out hauling problems with Service Casters.

SERVICE CASTER & TRUCK CO.
505 BROWNSWOOD AVE., ALBION, MICH.



Service ForgeWeld

Service

CASTER AND PUSH E-Z TRUCKS

TRADE LITERATURE

Air Conditioning—Bulletin, on central-system air conditioners.—Fairbanks, Morse & Co., 900 South Wabash Ave., Chicago.

Bakelite—Booklet, title "The Versatile Service of Bakelite Materials."—Bakelite Corp., 247 Park Ave., New York.

Bearings—Wall Card, covering line of cast bronze graphited bearings.—Johnson Bronze Co., New Castle, Pa.

Bearing—Booklet, on precision oil film bearing.—The Fast Bearing Co., Hampden Ave. & 23rd St., Baltimore.

Boiler Level Control—Leaflet 304, on boiler feeder and low-water cutoff.—McDonnell & Miller, 1308 Wrigley Bldg., Chicago.

Cable—Publication No. C-27, on Duraseal cable for direct burial in the ground.—Anaconda Wire and Cable Co., 25 Broadway, New York.

Chain Drives—Bulletin No. 49, with engineering data on silent chain drives.—Morse Chain Co., Ithaca, N. Y.

Circuit Breakers—Bulletin GEA-2406A, on Type FKO-227 outdoor oil-blast circuit breakers.—General Electric Co., Schenectady, N. Y.

Combustion Safeguard—Bulletin No. 1101, describing the Flame-otrol, a gas burner safety device for furnaces, ovens, boilers, and heaters.—Wheelco Instrument Co., 1933 South Halsted St., Chicago.

Compressor—Bulletin A-18, on WN-112 air or gas compressor.—Sullivan Machinery Co., Michigan City, Ind.

Controllers—Bulletin No. 2675, on line of liquid level controllers.—Cochrane Corp., 3124 North 17th St., Philadelphia.

Controls—Booklet, showing line of automatic controls for temperature, pressure, water level.—The Mercoid Corp., 4201 Belmont Ave., Chicago.

Cooling Coils—Catalog No. 5537, on cooling coils for water or brine.—Young Radiator Co., Racine, Wis.

Diesel Engines—Booklet No. 4127, title "Places for Power Supplied by Caterpillar Diesel Engines."—Caterpillar Tractor Co., Peoria, Ill.

Distribution System—Catalog, describing Universal Trol-E-Duct system of electrical distribution.—Bull Dog Electric Products Co., Detroit.

Electrical Equipment—Catalog No. 101, covering line which includes switches, panelboards, control equipment, fuse blocks, and connectors.—Trumbull Electric Mfg. Co., Plainville, Conn.

Fans—Bulletin 3733, on line of propeller fans and roof ventilators.—Johnson Fan & Blower Corp., 1319-25 West Lake St., Chicago.

Finance—Booklet, title "C. I. T. at Work in Industry," telling of different financing services.—Commercial Investment Trust Inc., 1 Park Ave., New York.

Fire Extinguisher—Folder, showing use of Lux Fire extinguisher.—Walter Kidde & Co., Inc., West St., Bloomfield, N. J.

Fittings—Bulletin WT23, describing Weld-Olets and ThredOlets, pipe fittings for making branch pipe connections by welding.—Bonney Forge & Tool Works, Allentown, Pa.

Floor Plate—Booklet, on "4-Way Floor Plate."—Inland Steel Co., 38 South Dearborn St., Chicago.

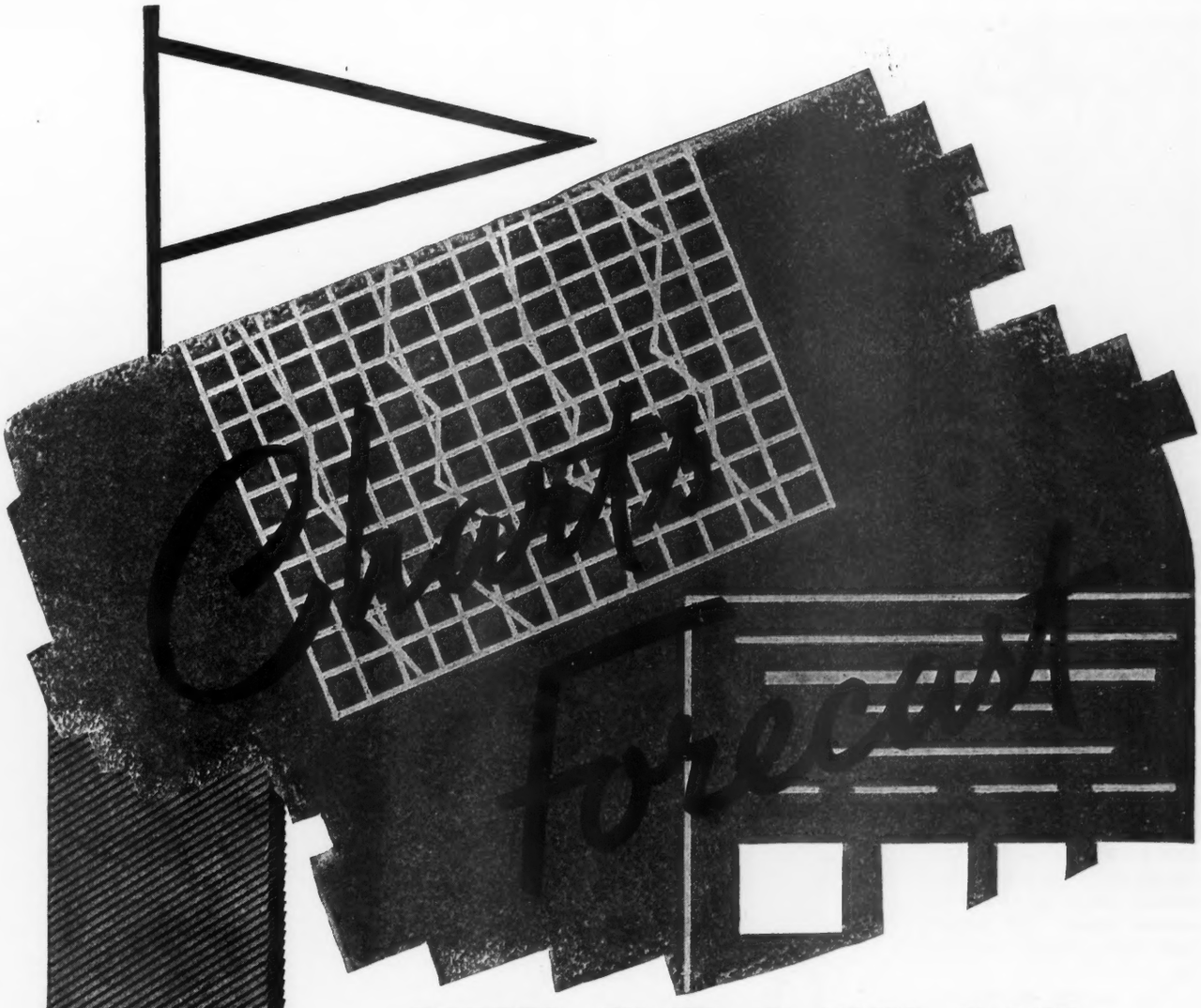
Gears—Bulletin, on silent gears made of Celoron, a laminated plastic.—Continental Diamond Fibre Co., Newark, Del.

Hand Trucks—Catalog and Price List No. T36, on pressed steel trucks and industrial truck wheels.—The American Pulley Co., 4200 Wissahickon Ave., Philadelphia.

Hard Facing—New edition of booklet, title "Hard Facing with Haynes Stellite Products."—Haynes Stellite Co., Kokomo, Ind.

Heating Equipment—Catalog, on industrial heating equipment.—Industrial Gas Engineering Co., Inc., 201 East Ohio St., Chicago.

Hose—Catalog, describing line of braided and molded hose.—Electric Hose & Rubber Co., Wilmington, Del.



BETTER FILING IN YOUR PLANT

Here are charts that definitely and certainly predict better filing in your plant . . . for they are accurate charts of the ability of the new Nicholson, Black Diamond and McCaffrey Files to do better work, remove more stock and lower file costs.

These charts record performance in rigid tests. They predict future performance just as accurately . . . for Nicholson, Black Diamond and McCaffrey Files are known the world over for *uniformly* high performance . . . what is done by dozens of our files in laboratory tests will be duplicated by thousands of dozens in industrial plants everywhere.

Mill supply and hardware wholesalers everywhere can supply you with Nicholson, Black Diamond and McCaffrey Files. Nicholson File Company, Providence, R. I., U. S. A.

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McCAFFREY

PATENTS PENDING

A FILE FOR EVERY PURPOSE

CLARCO HEATERS

These are the "little fellows" in the complete Clarage line, for heating small spaces, or where more heat is needed than present equipment can supply. Easily installed — suspended from the wall or ceiling. Suitable for pressures to 150 pounds. Fan and motor are quiet running. Large range of sizes.

REPEAT BUSINESS *Accounts for Over*

***72% of All* CLARAGE Unit Heater Sales**

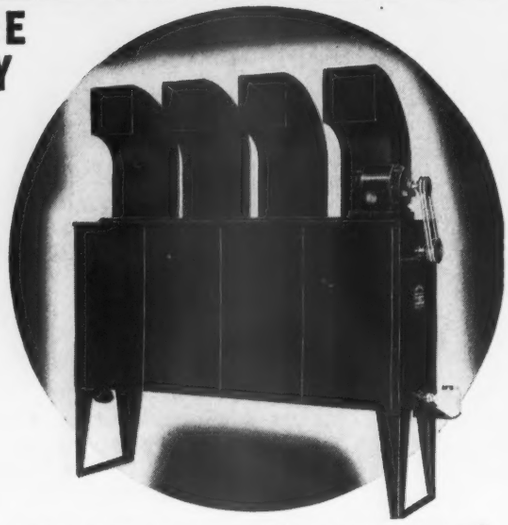
BETTER SERVICE the REASON WHY

From one automobile company we have received seventeen different orders for Clarage Unit Heaters — from another automobile company eight — from another six. One steel company has reordered seven times—one paper mill five times—and so on.

The extent of our repeat business is the best recommendation we know of for these highly-efficient, trouble-free industrial heating units. Over the years shrewd buyers have come back to us time and time again.

They know from experience that Clarage Unitherm Unit Heaters are equal to the toughest heating jobs. They know that Clarage Heaters "stand the gaff" season after season, operating smoothly, quietly and without upkeep expense. (We balance every centrifugal fan wheel BOTH statically and dynamically; use larger shafts; provide a bent-tube safety coil construction.)

If you have any type of factory heating problem —large or small—you SAVE MOST by using Clarage equipment. Write today for complete information.



Unitherm Units with Syncrotherm Control Save Fuel Cost in Large Space Heating

IMPORTANT FEATURES: 1. Furnished for either floor or suspended installation, using steam or hot water. 2. Heating coil good for pressures up to 200 pounds. 3. Equipped with centrifugal fans, permitting use of outlet piping if desired. 4. Every part accessible by removing front or back section of casing. 5. Large range of sizes.

SPECIFY CLARAGE for COMPLETE AIR CONDITIONING • VENTILATION • HEATING • COOLING • MECHANICAL DRAFT • FANS & BLOWERS FOR INDUSTRIAL NEEDS

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SALES ENGINEERING OFFICES IN ALL PRINCIPAL CITIES

Humidifier—Folder, on the Grid humidifier for installation on unit heaters.—The Unit Heater and Cooler Co., Wausau, Wis.

Hydraulic Equipment—Catalog No. H-37, on hydraulic cylinders, power units, and special equipment.—The Tomkins-Johnson Co., 617 North Mechanic St., Jackson, Mich.

Instruments—Bulletin No. 490, describing line of Metameter telemetering instruments. —The Bristol Co., Waterbury, Conn.

Instruments—Catalog No. 1060C, on line of indicating and recording temperature and pressure instruments.—C. J. Taglabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y.

Lacquer—Three leaflets: one, describing buffing lacquer No. 950, another, flexible silver lacquer No. 5985, the third, Blue Knight BA-Flex.—Roxalin Flexible Lacquer Co., Inc., Elizabeth, N. J.

Lubricant—Folder, on Lubriplate lubricant for textile machinery.—Fiske Bros. Refining Co., 129 Lockwood St., Newark, N. J.

Moisture Meter—Folder No. 1160, describing Tag-Heppenstall moisture meter.—C. J. Tagliabue Mfg. Co., Park and Nostrand Aves., Brooklyn, N. Y.

Motors—Bulletin No. 700, covering line of electric motors.—The Louis Allis Co., Milwaukee.

Packing—Catalog, showing eleven most-used packings in the company's line.—United States Rubber Products, Inc., Mechanical Rubber Goods Division, 1790 Broadway, New York.

Pipe Fittings—Catalog, on pipe unions and fittings.—E. M. Dart Mfg. Co., Providence, R. I.

Process Control—Catalog 2500, describing the Controlograph, an instrument for controlling temperature and pressure.—American Schaeffer & Budenberg Instrument Division, Manning, Maxwell & Moore, Inc., Bridgeport, Conn.

Protective Coating—Booklet, on "Stone Tex Restoration Process" for concrete and masonry.—The Truscon Laboratories, Detroit.

Pulleys—Leaflet, on adjustable-diameter "Wedgbelt" pulleys.—The American Pulley Co., 4200 Wissahickon Ave., Philadelphia.

Pumps—Bulletin 260-B11C, showing line of turbine pumps.—Roots-Connersville Blower Corp., Connersville, Ind.

Pumps—Three bulletins: 102, on deep-well turbine pumps; 105, on horizontally split case, double-suction, single-stage centrifugal pumps; 106, on horizontally split case, double-suction, two-stage centrifugal pumps. —Aurora Pump Co., Aurora, Ill.

Pyrometers—Broadside N-33, showing the Micromax and other of the company's line of pyrometers.—Leeds & Northrup Co., 4934 Stenton Ave., Philadelphia.

Refractory Concrete—Bulletin No. 320, on Insulcrete, a light-weight insulating refractory concrete.—Quigley Co., 56 West 45th St., New York.

Refrigeration—Bulletin No. 9143, on application and advantages of Steam-Jet Coolers, steam-jet water vapor refrigerating units.—Ingersoll-Rand Co., 11 Broadway, New York.

Sprockets—Catalog V-125, covering line of roller chain sprockets.—The Whitney Chain & Mfg. Co., Hartford, Conn.

Stackers and Elevators—Folder No. 508, showing uses and types of stackers, tiering machines, and portable elevators.—Lewis-Shepard Co., 175 Walnut St., Watertown, Mass.

Steel Wool—Folder, describing rope steel wool for use in cleaning floors.—American Steel Wool Mfg. Co., Inc., 42-24 Orchard St., Long Island City, N. Y.

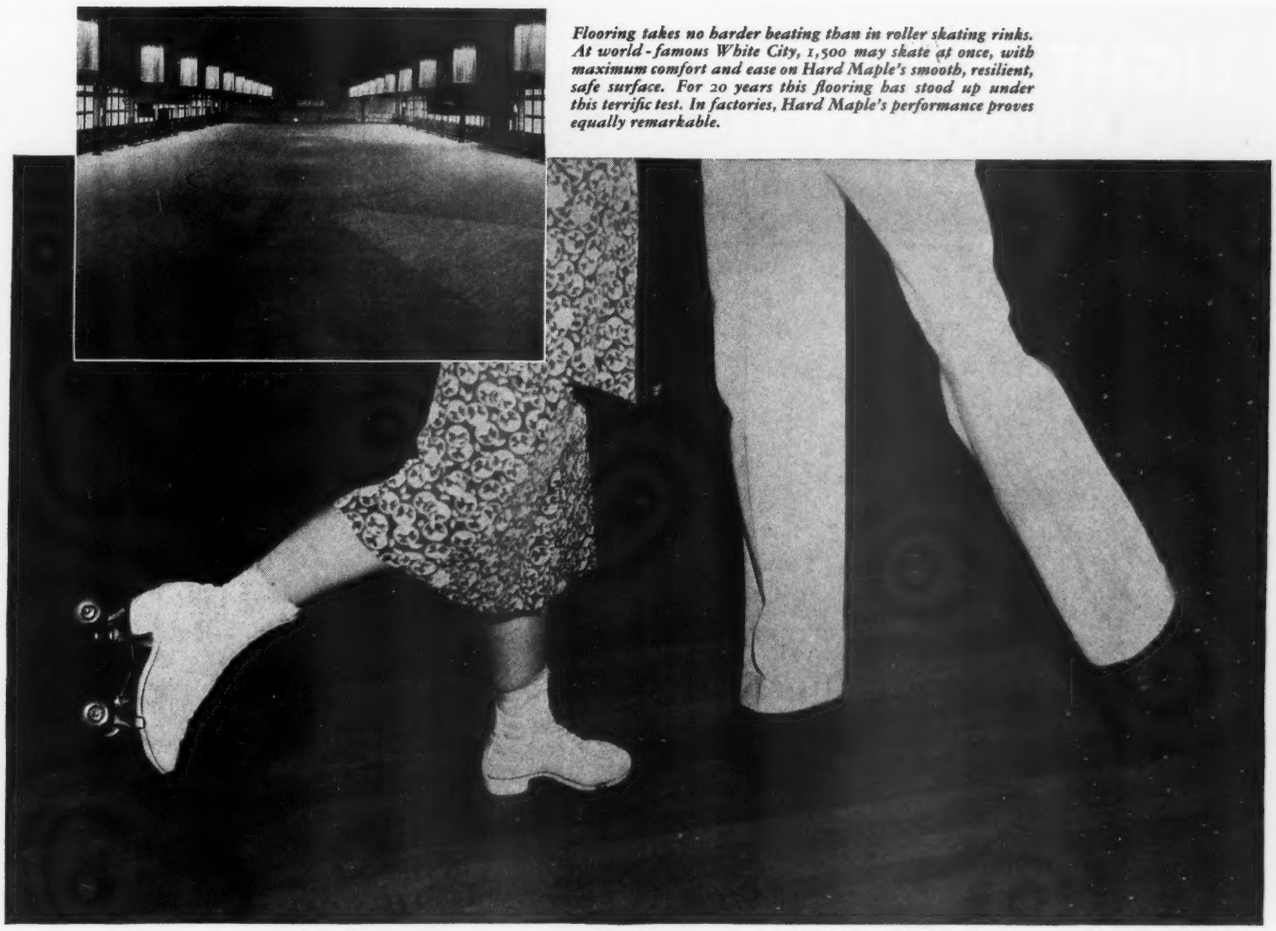
Switches—Bulletins 500 and 501, on Durakool mercury switches.—Durakool, Inc., Elkhart, Ind.

Switchgear—Bulletin GEA-2605, on miscellaneous switchgear.—General Electric Co., Schenectady, N. Y.

Tachometers—Bulletin 1510, on Frahm vibrating-reed tachometers.—James G. Biddle Co., 1211-13 Arch St., Philadelphia.

Turning Tool Head—Leaflet, describing commutator turning tool head.—Ideal Commutator Dresser Co., Sycamore, Ill.

Valve Control—Catalog, on the Limitorque automatic valve control.—Philadelphia Gear Works, G St. below Erie Ave., Philadelphia.



Flooring takes no harder beating than in roller skating rinks. At world-famous White City, 1,500 may skate at once, with maximum comfort and ease on Hard Maple's smooth, resilient, safe surface. For 20 years this flooring has stood up under this terrific test. In factories, Hard Maple's performance proves equally remarkable.

IMAGINE FLOORING-WEAR LIKE THIS . . . Every Day for 20 Years!

AS MANY AS 10,000 rolling wheels a night for 20 years . . . and still in good condition! Read what Chicago's White City says about Hard Maple's record at its roller skating rink:

"The Hard Maple floor at our White City rink was laid in 1917 and used practically every day since . . . Nearly 10,000,000 skaters have used this floor in the past 20 years.

"Nothing is so hard on a floor as roller skating—yet our Hard Maple floor is still in good condition, has had few repairs, and only occasional sanding, sometimes not being touched for two years at a time. Brushing alone keeps it clean.

"We have experimented with other materials on other properties, but always have run into difficulties . . . We know of no flooring comparable to Northern Hard Maple."

Performance like this indicates what tremendous savings Hard Maple Flooring offers factories. So tough-fibred, tight-grained, its resistance to abrasion is remarkable—does not splinter, sliver, or develop ridges. Warm, dry, resilient, it reduces fatigue, increases efficiency. Lastingly smooth, it *stays* sanitary, reduces cleaning costs... speeds up traffic... simplifies alterations. On every count, Hard Maple satisfies . . . and saves.

Before building or remodeling, check this superior flooring against your requirements. Insist on **MFMA*** Northern Hard Maple, (available in strips or blocks), the only flooring whose grading is **MFMA SUPERVISED.**

See our catalog data in Sweet's, Sec. 17/66. Write for folder describing good service finishes for old or new Hard Maple floors.

MAPLE FLOORING MANUFACTURERS ASSOCIATION
1787 McCormick Building, Chicago, Illinois

Floor *with* Maple

MFMA Approved

***MFMA**—This trademark on Maple Flooring guarantees that it conforms to the exacting grade standards of the Maple Flooring Manufacturers Association. It protects you against species substitution and inferior grade. It assures you of *genuine* Northern Hard Maple. Look for it on the flooring you buy.

NORTHERN HARD MAPLE IS THE LONGEST-WEARING COMFORTABLE FLOOR

LIGHT CONDITIONING
BANISHES EYESTRAIN AT AEROPLANE PLANT

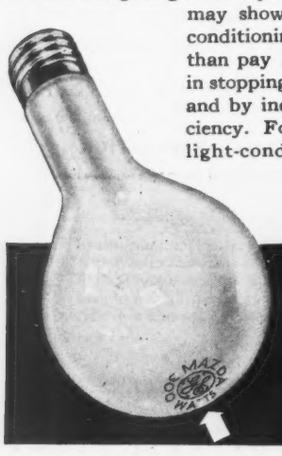
MEASURE LIGHTING WITH G-E LIGHT METER

The G-E Light Meter indicates light as simply as a thermometer measures temperature. Every plant executive should have one. Priced at only $11.50.

When a rush of work at the Curtiss Aeroplane & Motor Company's Buffalo plant recently necessitated more work from the design department, the men complained of headaches and eyestrain. Experiments were undertaken to determine the best light for the critical seeing task involved. Lighting engineers recommended a light-conditioning installation that would produce about 50% more light of a better quality than before.

According to the chief engineer at Curtiss, the new lighting has effectively solved the headache problem and has effected an outstanding improvement in employee satisfaction. A lighting check-up in your plant may show that light-conditioning will more than pay its own cost in stopping profit leaks and by increasing efficiency. For industrial light-conditioning is simply providing the right amount of light and the right kind of lighting for seeing and comfort wherever eyes are used. Your local lighting company will gladly make the necessary lighting check-up.

For specific information, write to General Electric Company, Dept. 166-I, Nela Park, Cleveland, Ohio.



GENERAL ELECTRIC
MAZDA LAMPS
They stay brighter longer

Valve Reseater—Folder, describing valve and faucet reseater.—Standard Reseater Corp., 423 West 126th St., New York.

Valves—Bulletin No. 2710, describing Multiport relief valves.—Cochrane Corp., 3124 North 17th St., Philadelphia.

V-Belts—Catalog No. 795, covering applications for single-groove V-belts.—Rockwood Mfg. Co., 1801–2001 English Ave., Indianapolis.

Water Treatment—Bulletin N-99S—744A, describing equipment for automatic pH recording and controlling.—Leeds & Northrup Co., 4906 Stenton Ave., Philadelpha.

Welding — Folder, describing "Selective Motor Horsepower Control" for welders.—Hobart Bros., Hobart Square, Troy, Ohio.

Welding Rods—Bulletin No. 20, on hard facing welding rods.—American Manganese Steel Co., 389 East 14th St., Chicago Heights, Ill.

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BOOKS

SUPPLEMENT TO MANAGEMENT BIBLIOGRAPHY

Compiled by R. M. Berg. The American Society of Mechanical Engineers, 29 West 39th St., New York. 88 pages, author index. $1.50.

Covering the period 1931–1935, this issue of the bibliography of management literature supplements the 1931 issue. It adds to the list 2,500 articles and books, all of which are classified by subjects and arranged alphabetically under each subject.

EMPLOYEE SAVINGS PROGRAMS

Helen Baker, Assistant Director, Industrial Relations Section, Princeton University. Industrial Relations Section, Princeton University, Princeton, N. J. 44 pages, bibliography. $1.

An analysis of recent trends in employee savings plans. With the object of determining status of these plans just prior to and at the end of the depression, and learning how they fared during the intervening period, this study traces the general trends from 1929 to 1936, basing its conclusions on information supplied by 322 companies. Classifying the plans by seven groups, it shows company experience with each one. There is a selected bibliography.

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ON THE CALENDAR

SEPTEMBER

23-25, National Industrial Advertisers Association, Inc., 1937 Conference, Chicago. Miss Mildred R. Webster, Headquarters Secretary, 100 East Ohio St., Chicago.

28-Oct. 1, Iron and Steel Exposition, Chicago, sponsored by Association of Iron and Steel Engineers. Brent Wiley, Managing Director, Empire Bldg., Pittsburgh.

OCTOBER

4-6, Fall Meeting, American Society of Mechanical Engineers, Erie, Pa. C. E. Davies, Executive Secretary, 29 West 39th St., New York.

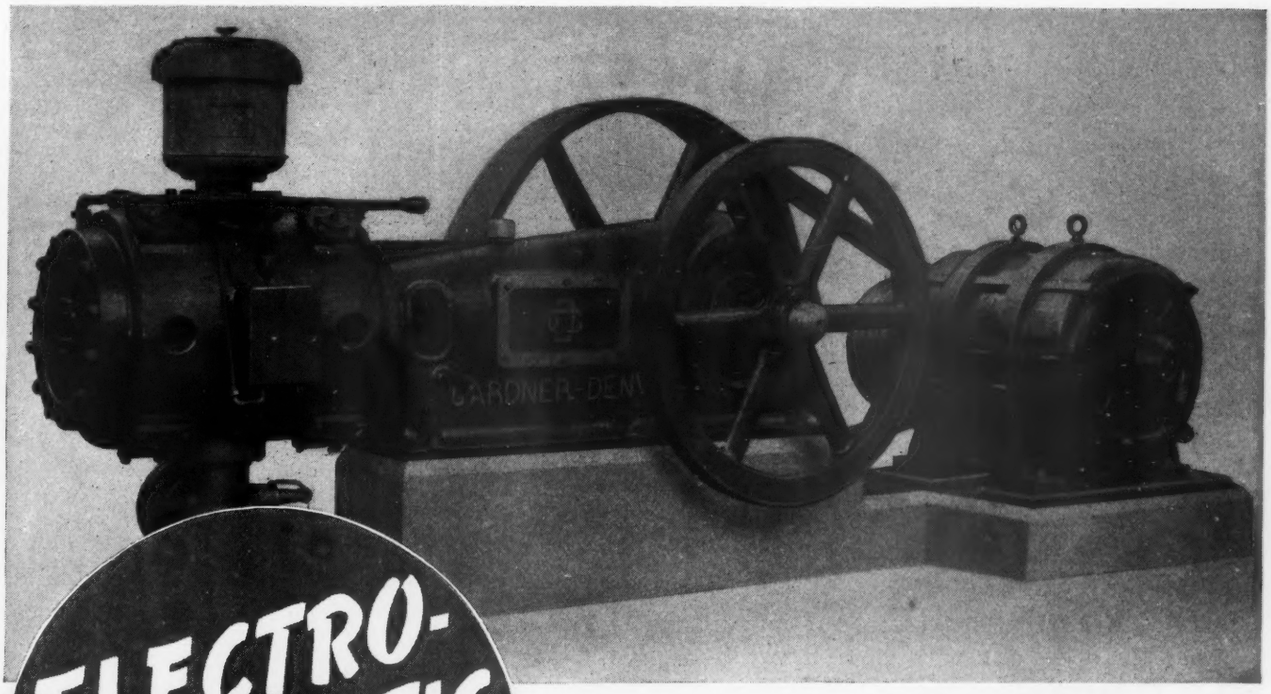
4-9, Chicago Exposition of Power and Mechanical Engineering, Chicago. Charles F. Roth, Vice-President, International Exposition Co., 480 Lexington Ave., New York.

11-15, National Safety Council, Annual Meeting, Kansas City, Mo. W. H. Cameron. Secretary and Managing Director, 20 North Wacker Drive, Chicago.

15–17, Annual Convention, National Association of Foremen, Detroit. E. H. Tingley, Secretary, 11 West Monument Bldg., Dayton, Ohio.

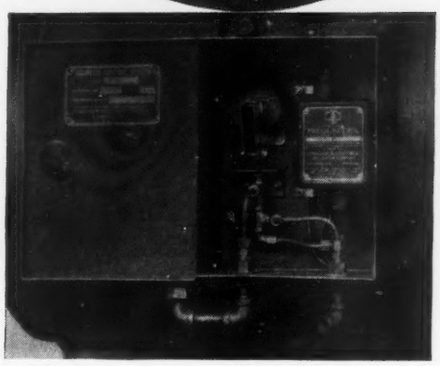
18-22, American Society for Metals, National Metal Congress and Exposition, Atlantic City, N. J. W. H. Eisenman, Secretary, 7016 Euclid Ave., Cleveland.

24-29, National Electrical Manufacturers Association. Annual Meeting, Chicago. W. J. Donald, Managing Director, 155 East 44th St., New York.



ELECTRO-PNEUMATIC CONTROL

Fits Air SUPPLY to Air NEEDS



Close-up view of Electro-Pneumatic Control

For greater economy and low power costs, Gardner-Denver "RX" Air Compressors have an electro-pneumatic control which automatically controls the supply in accordance with air demand. Other modern features of these compressors are:

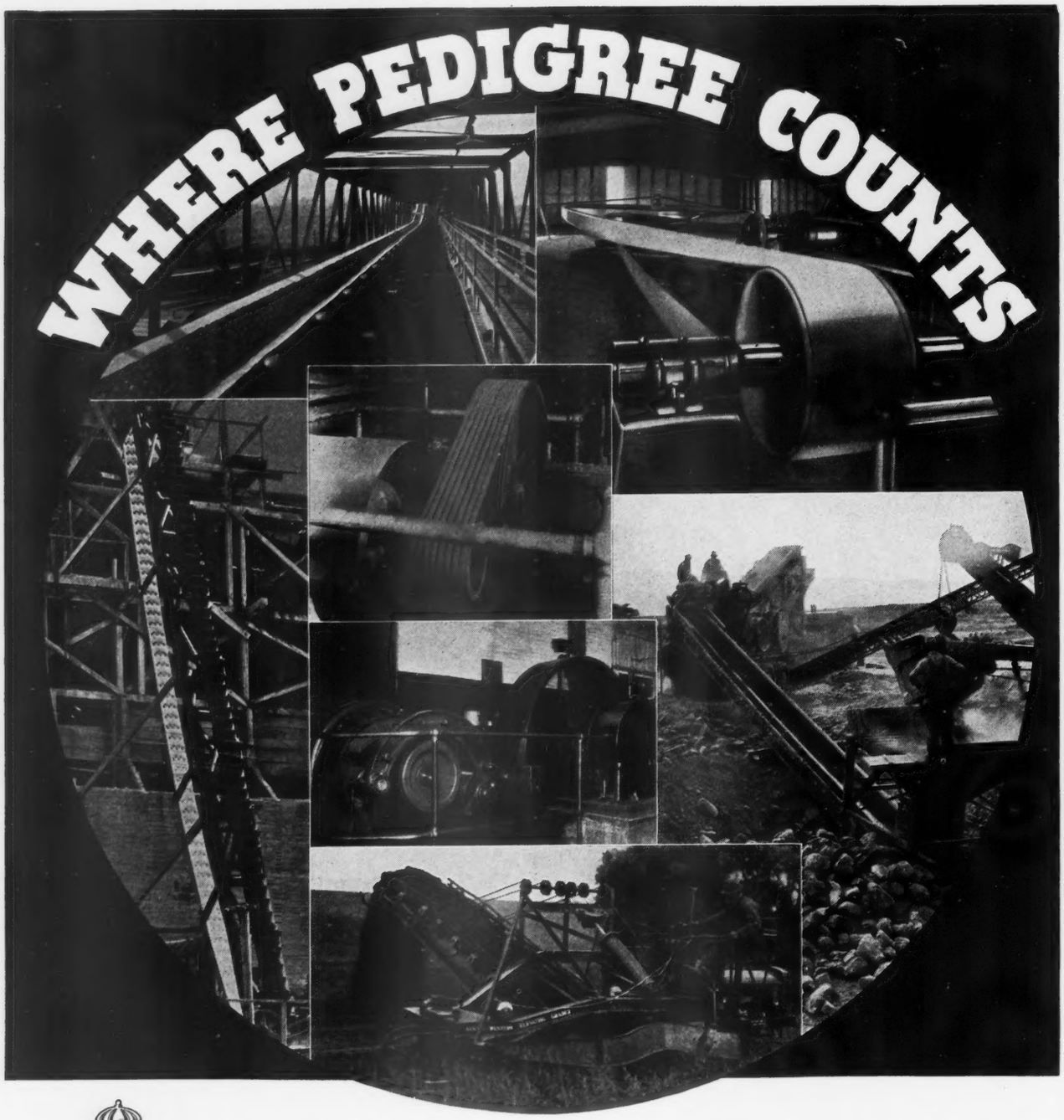
- **Heavy-duty construction—strength and ruggedness in every part.**
- **Totally enclosed—dustproof yet readily accessible.**
- **Free from vibration—accurately balanced and smooth-running . . . Timken Tapered Roller Bearings.**

"RX" Compressors are made in all commercial sizes. Write us for full details.

★

Since 1859 **GARDNER-DENVER COMPANY • QUINCY, ILLINOIS**

GARDNER-DENVER



Thermoid
INDUSTRIAL RUBBER PRODUCTS
BUILT FOR THE JOB
QUALITY VALUE SERVICE

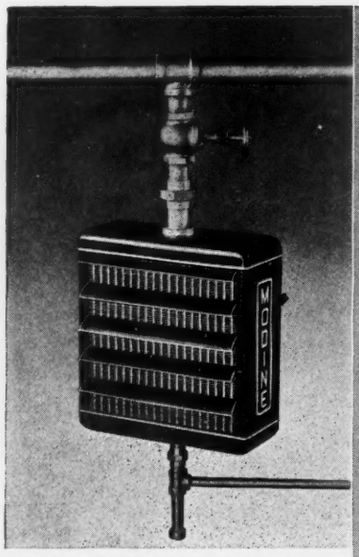
No single advertisement can suggest all the fields in which Thermoid Belting has long been the recognized standard. Nor can we do justice here to the most recent addition to the Thermoid Belting family — *the new Multiple-V type.* With thousands of supply houses and plant operators for over 57 years, this trade-mark on belting has been an assurance of outstanding performance and economy in operation. In belting, as with many other things, *it's pedigree that counts.*

Thermoid

Standard types of belting made by Thermoid:

Conveyor Belting
Transmission Belting
Multiple-V Belts
Grader Belting
Canners' Belting
Bucket Elevator Belting
Grain Elevator Belting
Agricultural Belting
Hog Scraper Belting
Endless Thresher Belting
Oil Country Belting
Axle Lighting Belting

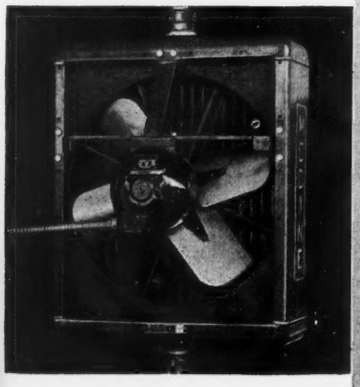
THERMOID RUBBER, DIVISION OF THERMOID COMPANY, TRENTON, N. J.



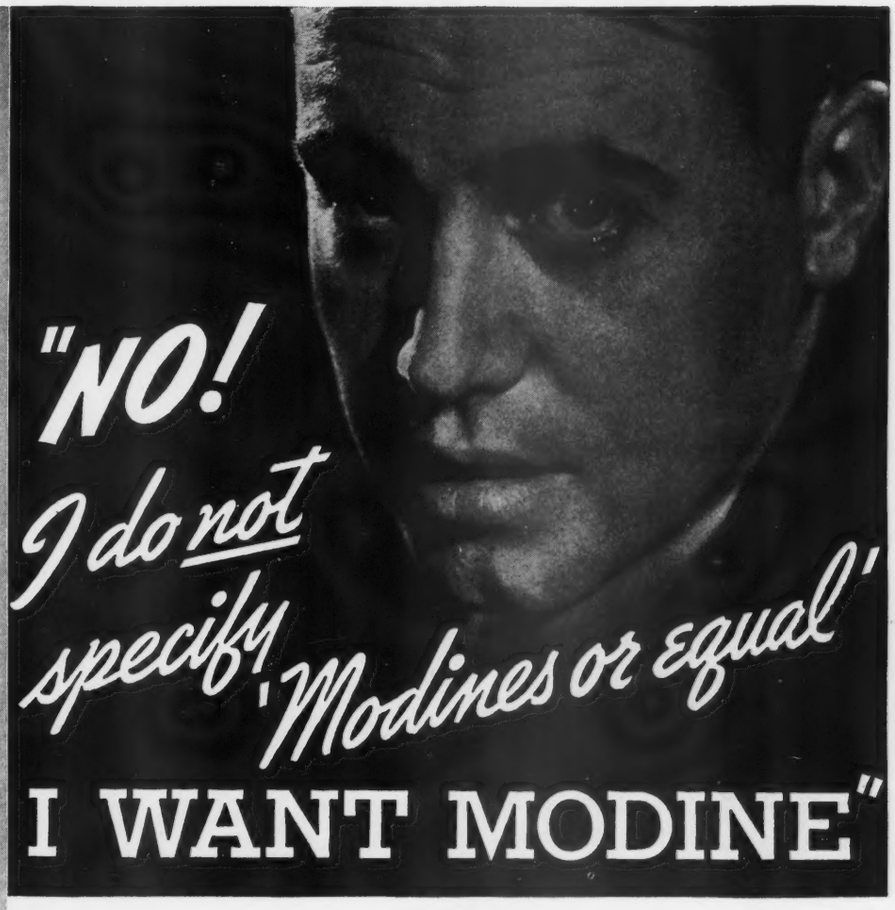
Suspended directly from the steam line, without brackets, rods or straps . . . a Modine patented feature . . . Modines cost less to install.

INLET AND OUTLET ARE SOLID BRONZE CASTINGS
TOP AND BOTTOM TANKS ARE IRON PIPE SIZE SOLID COPPER
RED-BRASS TUBES
COPPER FINS
EXPANSION BEND

Inlet to outlet, the Modine condenser is all copper or copper alloy. All steam-carrying passages are cylindrical for excess strength. Metallic bonding prevents possibility of reduction of heat transfer from tubes to fins.



Only Modine has velocity generators, directing and controlling the air stream, producing greater heat throw without increasing power requirements.



THE
UNIT HEATER
THAT IS IN A CLASS BY ITSELF

● "All men are created equal"—but unit heaters are *not*. There are unit heaters—and there are *Modines*. Advanced in design . . . improved in construction . . . proved in performance—Modines offer many outstanding advantages that simply do not exist in other unit heaters.

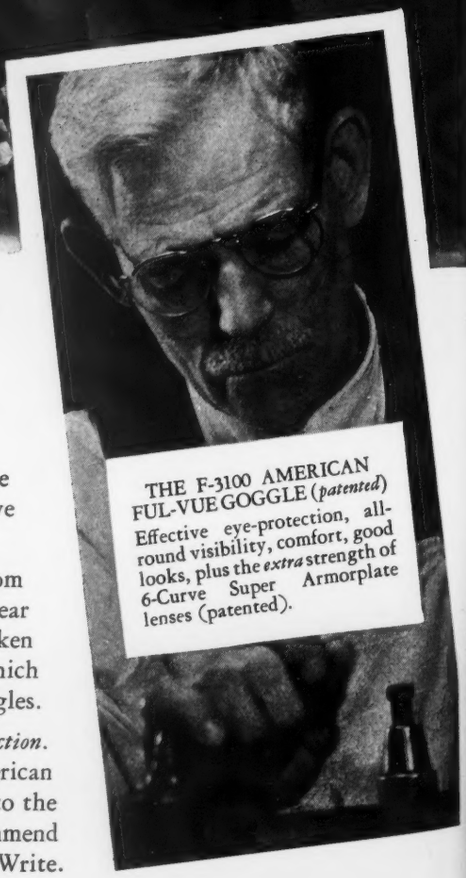
Modines are infinitely stronger materially and structurally . . . and more effective in heat transfer. The all-copper condenser is built to withstand high steam pressures and temperatures *without leaking*. Its *expansion bend* construction . . . a development *exclusively Modine* . . . permits free individual knee-joint expansion and contraction of each tube independently of the others.

Modines heat faster, distribute heat more thoroughly and evenly . . . direct it exactly where needed to keep floors and working zones comfortable. No cold spots or drafts. Fuel savings alone are 25 per cent and more. Find out why *more Modines are being sold than any other unit heater.* Write for catalog 236.

MODINE MANUFACTURING COMPANY
1730 RACINE STREET RACINE, WISCONSIN

HEATING, COOLING AND AIR CONDITIONING EQUIPMENT FOR INDUSTRIAL, COMMERCIAL AND RESIDENTIAL APPLICATION

Keep Eyes in Working Order with GOGGLES



THE F-3100 AMERICAN FUL-VUE GOGGLE (*patented*) Effective eye-protection, all-round visibility, comfort, good looks, plus the *extra* strength of 6-Curve Super Armorplate lenses (patented).

Don't let eye-injuries impose an employment problem. Trained eyes are at a premium — and those now watching over your machines may not prove easy to replace.

And there are other problems, too. You can figure your costs (they're seldom small) in compensation and administration — unless complications appear under medical treatment. But how can you estimate loss of time, sunken morale, and other *hidden* liabilities? The average total is $2,000 — for which you could put the eyes of 1,000 men or more *safely* behind American Goggles.

Find out how economical it will be to give your entire plant *Planned Eye-Protection*. Call in your neighbor, the industrial representative from the nearest American Optical office. His trained eye will spot every eye-hazard, right down to the dangerous "insignificant" ones that might be overlooked. And he will recommend the right goggles for each man and his job from the complete American line. Write.

AMERICAN OPTICAL COMPANY

Manufacturers, for more than 100 years, of products to aid and preserve vision. Factories at Southbridge, Mass. In Canada, Consolidated Optical Co., Ltd. Branch Offices in all principal industrial centers

4000

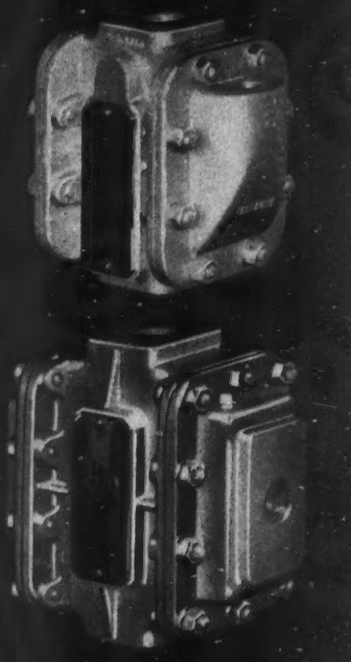
HARRISON

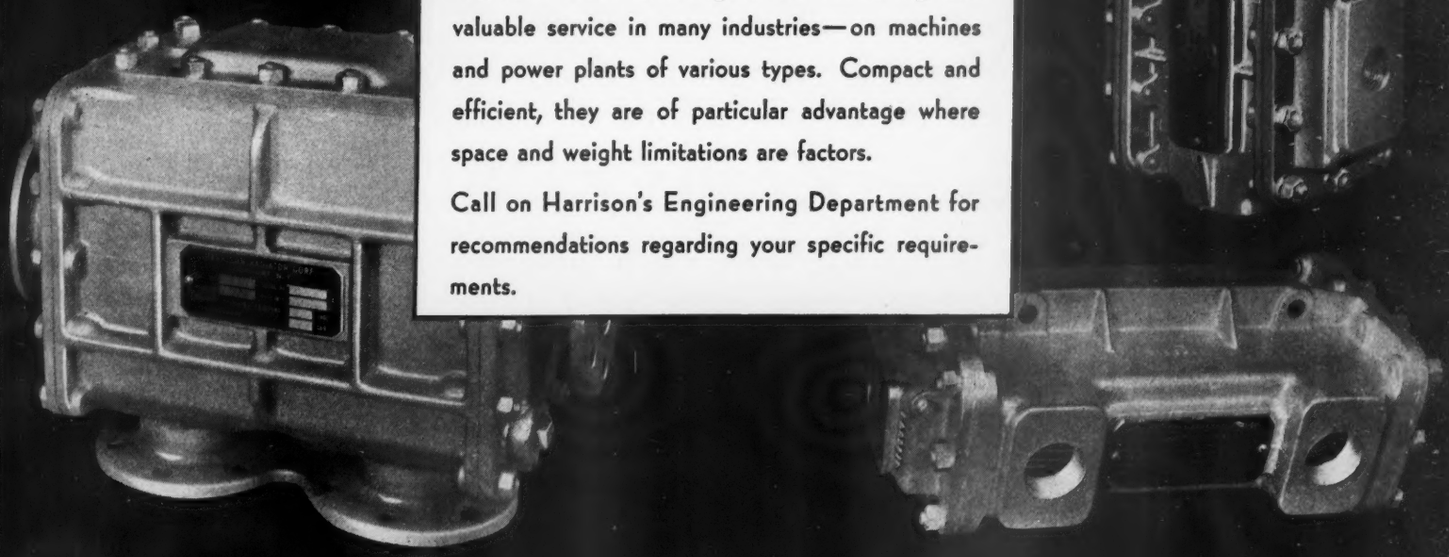
HARRISON
HEAT EXCHANGERS
For Better Oil Cooling

By maintaining oil temperatures within the range required for best lubrication, Harrison Heat Exchangers lessen wear on bearings and cylinders—and prolong the life of industrial machines.

Harrison Heat Exchangers are rendering this valuable service in many industries—on machines and power plants of various types. Compact and efficient, they are of particular advantage where space and weight limitations are factors.

Call on Harrison's Engineering Department for recommendations regarding your specific requirements.





HARRISON RADIATOR DIVISION
GENERAL MOTORS CORPORATION
LOCKPORT, N. Y.

Got a Job for a

TOUGH BABY?

Gilmer BELTS

Get Gilmer KABLE KORD

KABLE KORD licks the trouble out of tough belt drives. Kable Kord stands up and takes it. Kable Kord's *tough*. Belt engineers build this two-in-one belt . . . there's no other flat belt like it. Pulling cords *plus* contactor cords make Kable Kord deliver maximum power per square inch. It *hugs* flat pulleys —its snugger grip can't slip. Kable Kord stops power waste. Lowers operating costs. Saves money. Lasts longer. Pays you premiums in POWER.

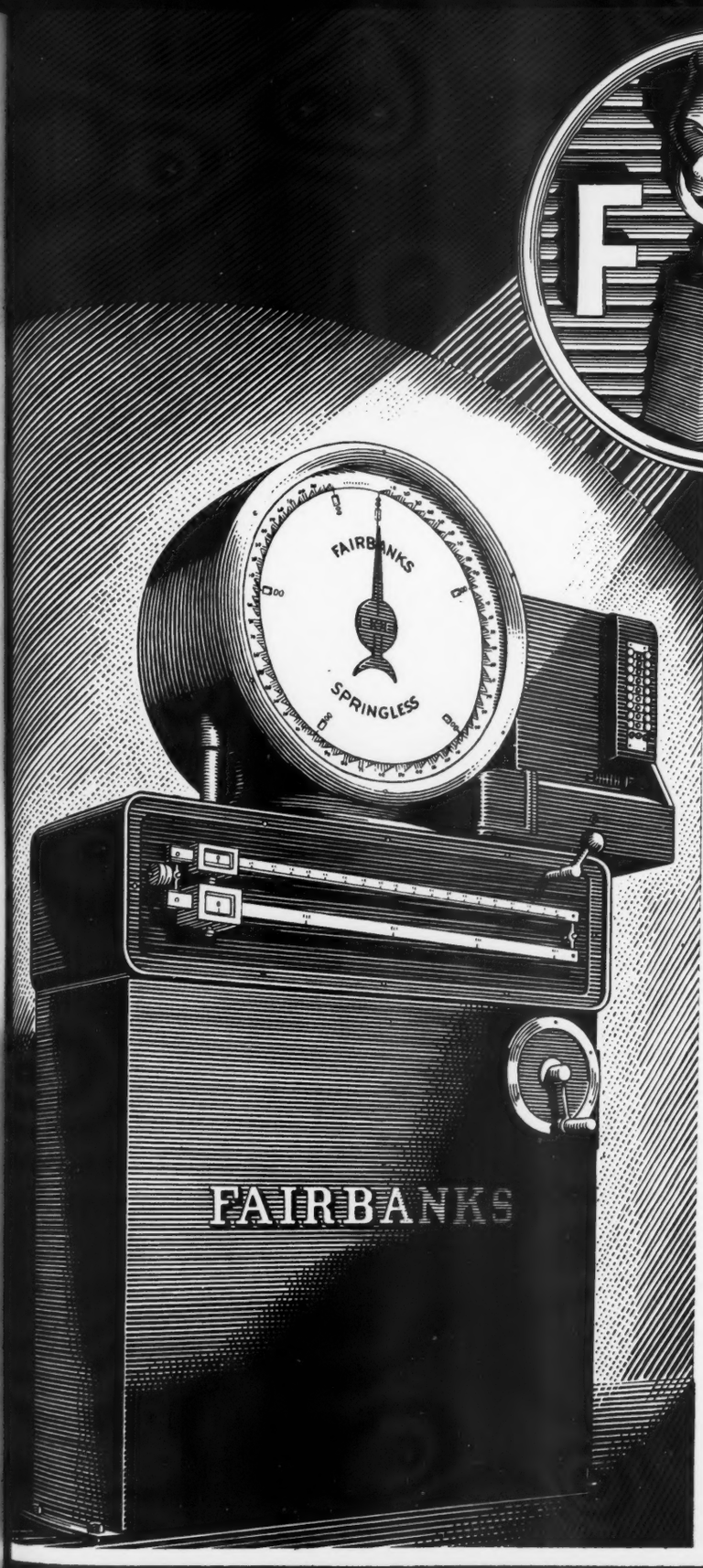
FREE

KABLE KORD DATA BOOK

Expert help from Gilmer engineers, the men who build only belts.

L. H. GILMER COMPANY, Tacony, Philadelphia

THE OLDEST FIRM OF RUBBER FABRIC BELT SPECIALISTS



REPLACE

INACCURATE EYES AND FORGETFUL PENCILS WITH

F-M.

PRINTOMATIC WEIGHERS

● Weight records can be perfect. The Fairbanks Printomatic Weigher does not have to be read by the eye or recorded by a scribble. There is no chance for even the smallest fraction to be missed . . . for the wrong weight to be set down through forgetfulness . . . or for hurried figures to be misread. Automatically, the weight to a fraction is printed in easily read figures on a ticket, or on a tape locked away in a tamper-proof case.

The Printomatic Weigher is supplied as standard equipment on Fairbanks scales for a wide variety of services, or attached to your present Fairbanks scales. Get the whole story by writing for Bulletin ASB580. Fairbanks, Morse & Co., 900 S. Wabash Ave., Chicago, Ill. And 40 principal cities—a service station at each house.

7092-5A40.49

FAIRBANKS MORSE

REFRIGERATORS
RADIOS
WASHERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

FAIRBANKS SCALES

Scales

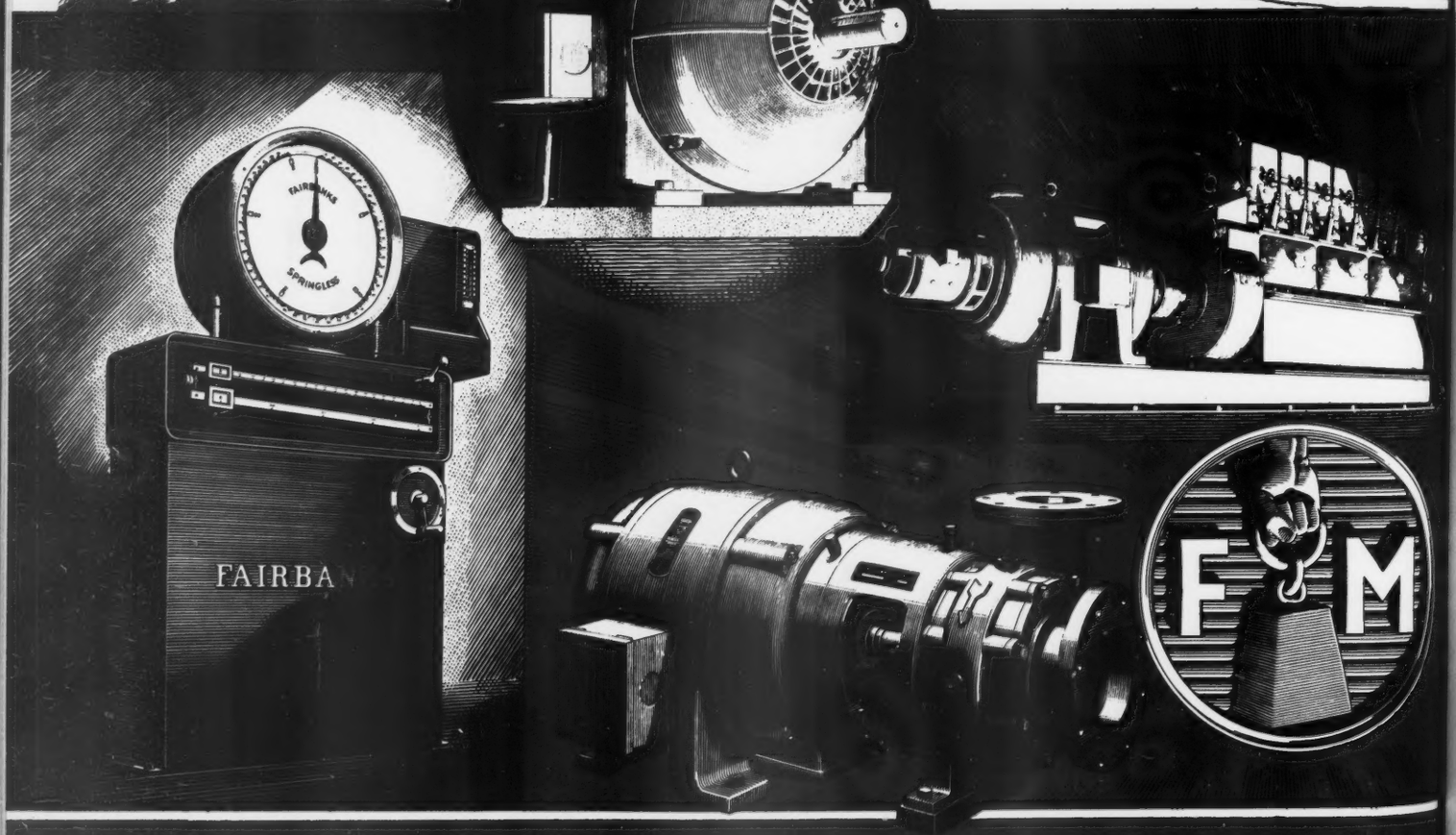
IN MAN OR MACHINE . . .

Pioneer Means Self-Reliant

● When the first product of the Fairbanks-Morse family was introduced, 107 years ago, there was only one engineering school in the English-speaking world, and only one other course in engineering offered.

Pushed out into a world where mechanical skill was a rarity, Fairbanks-Morse products had to have the same degree of self-reliance which characterized the early pioneers. Thus, the tradition of achieving dependability through simple design began with the first Fairbanks-Morse product. Inheriting this self-reliance, modern Fairbanks-Morse Diesels, pumps, and motors and Fairbanks scales continue to pioneer in the dark corners of the earth, as well as to be self-reliant in industrial plants throughout this country.

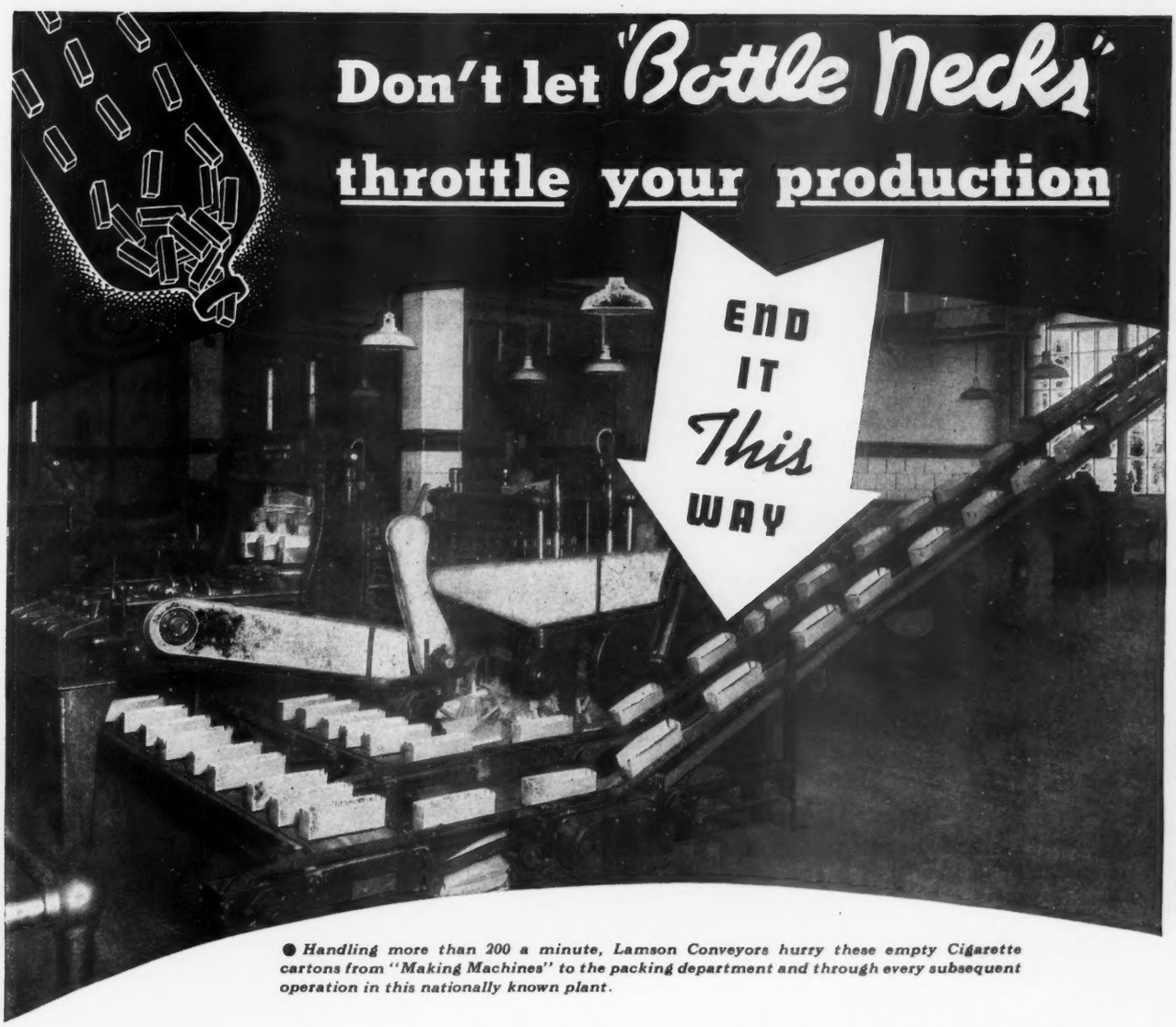
For information, address Fairbanks, Morse & Co., 900 S. Wabash Avenue, Chicago, Ill. 34 branches at your service throughout the United States.



FAIRBANKS - MORSE

Power, Pumping, and Weighing Equipment

107 YEARS OF PRECISION MANUFACTURING



● *Handling more than 200 a minute, Lamson Conveyors hurry these empty Cigarette cartons from "Making Machines" to the packing department and through every subsequent operation in this nationally known plant.*

NO alert plant operator can afford to let "bottle necks" interfere with production. Because "bottle necks" throw the whole production line out of pace. They waste valuable time, slow up shipments and cost good hard cash.

Hundreds of plants have found a *fast way through* these traffic jams by the *better routing* of materials with Lamson Conveyors. Sometimes by merely revamping the present conveyor system to meet a new demand—or by the addition of another conveyor line to clear away the slow spot.

There's a ready Lamson answer to *every kind* of conveying problem. Trained Lamson engineers will gladly help you. Lamson recommendations are backed by 50 years of product-handling experience—by a complete line of conveying equipment.

Write *today*—ask for the nearest Lamson engineer to call. Or send the coupon for our Conveyor book.

LAMSON CONVEYORS

THE LAMSON COMPANY, INC.
Syracuse, N. Y.

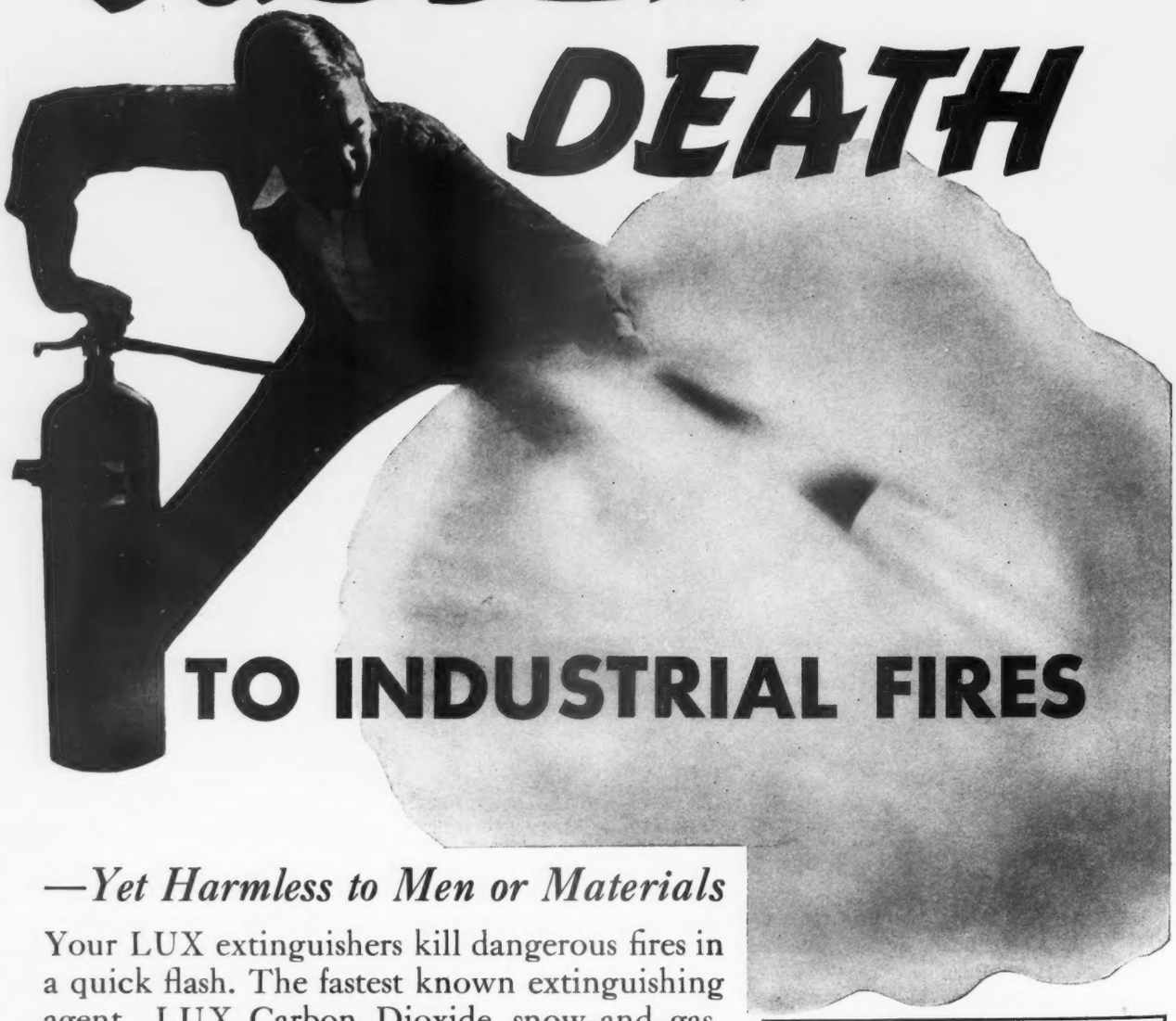
☐ Send me a FREE copy of your 24-page book on Lamson Conveyors.

☐ Have your engineer call.

Name.....

Address.....

SUDDEN DEATH



TO INDUSTRIAL FIRES

—*Yet Harmless to Men or Materials*

Your LUX extinguishers kill dangerous fires in a quick flash. The fastest known extinguishing agent, LUX Carbon-Dioxide snow-and-gas, smothers the most hazardous industrial blazes with split-second speed.

Yet LUX does no damage. It is safe on delicate electrical equipment. Leaves no messy residue. LUX has no poisonous or harmful qualities.

For all ordinary or extraordinary industrial fire hazards, insist on LUX. It's your finest protection.

When you write, mention the type of hazard you wish to protect. We will mail complete details and brochure.

LUX FIXED SYSTEMS

For a severe and concentrated hazard, best protection is a built-in LUX system. A battery of LUX Carbon-Dioxide Cylinders delivers a heavy concentration of LUX snow directly to the heart of the fire area.

Used on lacquer dip tanks, oil storage rooms, generators, transformers, etc., operated automatically or manually.

LUX SNUFFS OUT FIRE

Walter Kidde & Company — 22 West Street, Bloomfield, N. J.

Three 100-kva G-E Pyranol transformers installed at the plant of the Eli Lilly Co., Indianapolis, Ind.

PYRANOL TRANSFORMERS SHOW SUBSTANTIAL SAVINGS IN INDOOR INSTALLATION

THE Eli Lilly Company of Indianapolis, manufacturing chemists, made a substantial saving in total installed transformer cost when it ordered G-E Pyranol transformers for this new installation. Short runs of secondary cable were desired, and Pyranol transformers could be installed at the load center without the expense of heavy vault construction. Installation of oil-filled transformers outdoors to save vault-construction expense would have entailed long secondary cable runs and would have marred the attractive appearance of the plant. This installation was made in the basement—the noninflammable, nonexplosive Pyranol transformers affording a high degree of safety.

● It will pay you to use Pyranol transformers for your plant—particularly if you are considering a new indoor installation. Recognition of Pyranol by the National Electrical Code permits their installation indoors with many of the restrictions applying to oil-filled transformers removed. More than 300,000 kva of these transformers are installed—many having been operating more than five years—all giving excellent service. For complete information write the nearest G-E sales office, or General Electric Company, Dept. 6G-201, Schenectady, N. Y. Ask for Bulletin GEA-2048.

300-51

GENERAL ELECTRIC

Invest in Closer Control—

TO STOP PROFIT LEAKS

Rising costs of materials and labor make operating savings imperative if profit margins are to be maintained. Elimination of waste and delay call for closer control; and close control with economy calls for Masoneilan Instruments.

For instrumentation need not be expensive. A great majority of all processes require only the simplest types; and in most cases the savings effected quickly offset the moderate cost of Masoneilan control.

Get the facts on closer control in your plant. Write for Bulletins 2345 and 2500-D.

MASONEILAN

MASON-NEILAN REGULATOR COMPANY, 1194 ADAMS STREET, BOSTON, MASS., U. S. A.

New York Philadelphia Pittsburgh Chicago Tulsa St. Louis Houston Los Angeles

MODERNIZE WITH FRIGIDAIRE

WATER COOLING EQUIPMENT

● Bring your plant up-to-date. Give it the stamp of progress and success—modernize with Frigidaire Water Cooling Equipment.

Plenty of cool, refreshing water at the proper temperature means employee comfort and good will . . . greater efficiency, more production . . . fewer accidents. And Frigidaire equipment also means a tremendous saving in actual dollars and cents over ice. A saving so great that Frigidaire really pays for itself in a short time and continues to earn a big investment return for years to come. This statement is backed by actual facts and figures on thousands of Frigidaire installations now in use.

Frigidaire Equipment has the flexibility and capacity to meet every industrial requirement—completely, efficiently, and economically. It will pay you to get full details and first-hand information. For Free survey and estimate, see your dealer, or write Frigidaire Division, General Motors Sales Corp., Dept. 68-9, Dayton, O.

FRIGIDAIRE
MADE ONLY BY GENERAL MOTORS

Get these 7 EXTRA FEATURES IN YOUR NEXT LIFT TRUCK

1 HYDRAULIC ELEVATING MECHANISM—Simple, self-lubricating, and efficient—no power needed to lower loads.

2 DOUBLE REDUCTION DRIVE AXLE—Spiral bevel and spur gearing—integral unit assembly readily accessible.

3 SNAP-ACTION MECHANICAL CONTACTOR CONTROLLER—Reduces arcing to an absolute minimum.

4 SEMI-ELLIPTIC SPRINGS—Cushion truck and loads.

5 ALL WELDED, STREAMLINED CONSTRUCTION—Of ample strength and pleasing appearance.

6 STURDY TRAIL AXLE—Wheels and knuckles ball bearing mounted for easy steering.

7 HYDRAULIC RELIEF VALVE—Provides overload protection.

MERCURY Lift Trucks are engineered for your service. Capacities, traveling speeds, hoist speeds, and all other details are designed to fit your particular needs.

Mercury gives you more. SEVEN plus features are built into every Mercury Lift Truck. They assure you safe operation—greatest efficiency in all types of service—lower operating costs—and the elimination of costly "time out" for repairs.

Investigate Mercury's outstanding design features. Send for complete information and bulletins that will help you in the selection of your next lift truck.

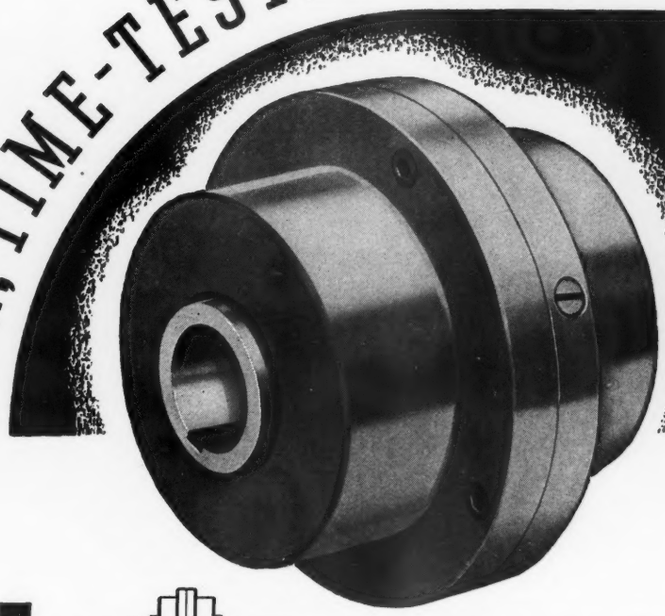
MERCURY MANUFACTURING CO.
4110 South Halsted Street, Chicago

Trucks illustrated are Mercury Models A-1005, A-1001, and A-1002, left to right.

MERCURY

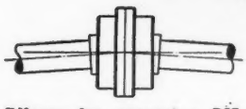
LIFT TRUCKS · TRACTORS · TRAILERS

NEW, TIME-TESTED FLEXIBLE COUPLING



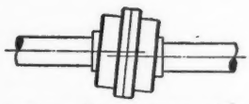
Compensates for
ALL FOUR
DRIVE CONDITIONS
without increasing
BEARING LOADS!

1



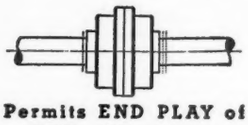
Allows for excessive ANGULAR misalignment of shafts.

2



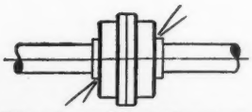
Allows for excessive OFFSET misalignment between shafts.

3



Permits END PLAY of shafts with minimum resistance.

4



Absorbs and Smoothens out SHOCKS and Vibrations in the drive.

FLEXIBLE IN ALL DIRECTIONS —full floating, semi-universal joint design. Operates silently. Permanently self-lubricated. Saves power and bearings.

NOW—A super, all-metal flexible coupling that effectively solves your direct drive problems. Designed to handle EXTREME drive conditions. Built to withstand the gaff of hard, everyday service.

The RYBECK Coupling is an outstanding advance in the design of flexible couplings. TIME-TESTED over a period of 8 years under practical operating conditions. Used successfully on direct drives where heavy duty service is required—on boring mills, pumps, oil drilling rigs, hoists, and similar installations.

More than merely a coupling, the RYBECK actually FLOATS! It is the ONLY coupling on the market that successfully takes care of all four drive conditions, even when they are present to an excessive degree.

Get the complete story of this new, TIME-TESTED coupling.

Write for new bulletin shown below.

THE T. L. SMITH COMPANY

Established 1900

2812 N. 32nd STREET MILWAUKEE, WIS.

GET THIS BULLETIN

Fill in coupon below and drop it in the mail. No obligation on your part.

RYBECK
TRADE MARK
FLEXIBLE COUPLING

The T. L. SMITH CO.
2812 N. 32nd Street
Milwaukee, Wis.

Please send copy of Rybeck Flexible Coupling Bulletin to:

Name.....

Firm.....

Address.....

A 2086-1PC (937)

SPRAY GUNS
MATERIAL CONTAINERS
REGULATORS
SPRAY BOOTHS
EXHAUST FANS
HOSE AND CONNECTIONS
AIR COMPRESSORS
ACCESSORIES

DeVilbiss

THE COMPLETE SPRAY-PAINTING AND FINISHING SYSTEM

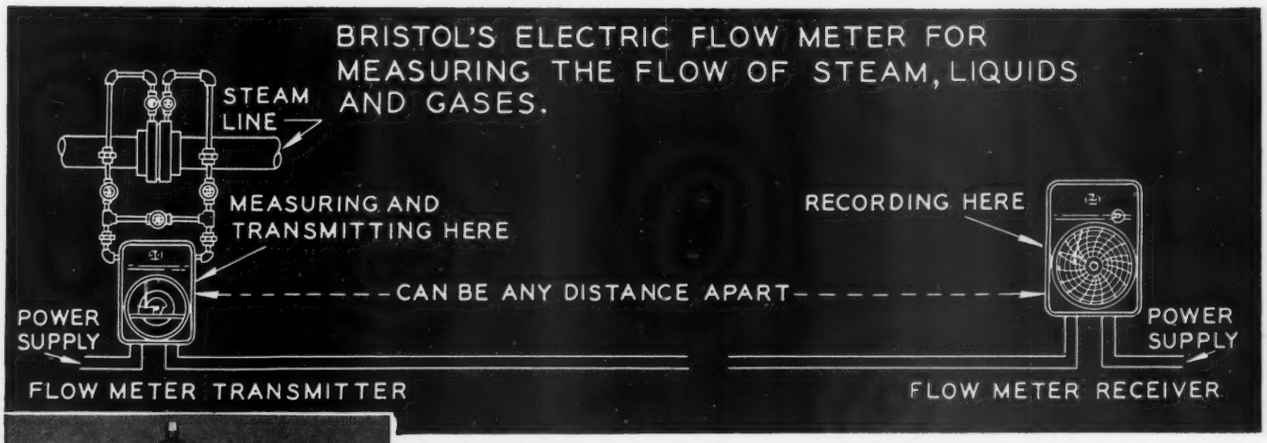
The comprehensive DeVilbiss System includes every item of equipment needed in the modern spray process, from beginning to end.

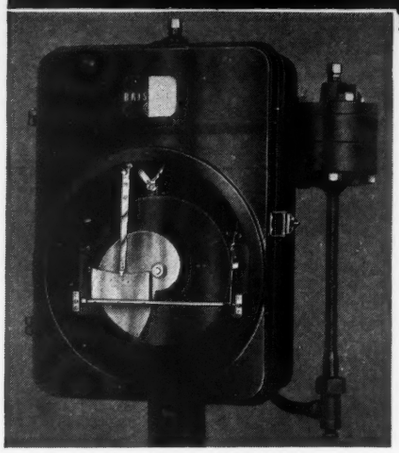
There are many different types of equipment comprising a spray-finishing installation — air compressors, material containers, regulators, hose, hose connections, spray guns, exhaust equipment and accessories. And while each element in a DeVilbiss installation has its own particular job to do, at the same time all the parts work together as a well coordinated system. Every function is performed with speed and precision —from the production of compressed air right through to the ventilation of the finishing area.

In all production finishing and maintenance painting operations, DeVilbiss Equipment can increase efficiency and lower costs. Should it happen that your own problems are so extraordinary that they cannot be met by the broad standard DeVilbiss line, our engineering and research departments are always available to plan a special installation exactly suited to your individual needs.

THE DEVILBISS COMPANY • TOLEDO • OHIO

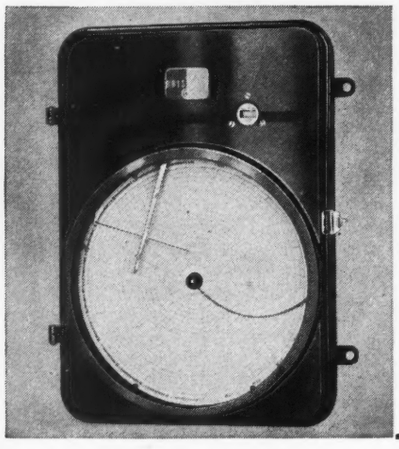
Now...a new
ELECTRIC FLOW METER
offering a SIMPLE, LOW-COST *method for measuring and integrating flow*


BRISTOL'S ELECTRIC FLOW METER FOR MEASURING THE FLOW OF STEAM, LIQUIDS AND GASES.
STEAM LINE
MEASURING AND TRANSMITTING HERE
RECORDING HERE
CAN BE ANY DISTANCE APART
POWER SUPPLY
POWER SUPPLY
FLOW METER TRANSMITTER
FLOW METER RECEIVER



Transmitter, located at point where flow of steam or other fluid is to be measured.

Recording Receiver, in your office or other central headquarters. Models for indicating, recording and integrating flow.



FOR LIQUIDS, GASES, STEAM

To guess is costly. By means of this new Bristol's Electric Flow Meter, it is possible for you to keep a continual check over the consumption of liquids, gases and steam—by each department and by each machine. You can figure and allocate your costs correctly; and, what is equally important, you can detect waste, leakage and loss before it amounts to alarming totals.

WRITE FOR NEW CATALOG NO. 105-OL JUST OFF THE PRESS

FEATURES AT A GLANCE!

1. Offered for measuring steam, water, air, gases and solutions.
2. Accuracy not influenced by circuit characteristics. No voltage regulators required.
3. Simple two-wire circuit between transmitter and recording receiver. Telephone circuits may be used.
4. Measurements transmitted any distance up to several hundred miles.
5. New electrical integrating mechanism assures extreme accuracy.
6. Special chart integrator also available. Conveniently totalizes flow at periphery of chart.
7. Uniform chart scale.
8. Moisture-, fume- and dust-proof case for transmitter and recording receiver.
9. Electric contact enclosed in glass.
10. Models for indicating, recording, and integrating.
11. For installation on panel, wall, pole or for flush mounting.
12. Several receivers may be connected to one transmitter.

THE BRISTOL COMPANY · WATERBURY · CONN.
Branch Offices in Principal Cities.
Toronto, Ontario, Canada. London, England

BRISTOL'S
TRADE MARK REG. U.S. PAT. OFF.

UP IN THE AIR?

ARE HANDLING costs in your plant "up in the air"? The down-to-earth suggestions of the Baker Materials Handling Engineer will help you bring stubborn cost figures into line. His authentic, detailed reports on performance and costs, covering thousands of handling problems will prove helpful to you. You can determine the value of Baker Equipment in your own plant. And the Baker reputation as builders of long-lived equipment guarantees you many years of substantial savings . . . Get the facts on Bakers for your own handling problems. Write the INDUSTRIAL TRUCK DIVISION *of the Baker-Raulang Company,* 2178 W. 25th St., Cleveland, O.

OLDEST MANUFACTURER
Baker
TRADE-MARK REG. U. S. PAT. OFF.
OF ELECTRIC VEHICLES

POWER INDUSTRIAL TRUCKS FOR EVERY PURPOSE

PUT all available light in your plant to work. Turn wasted foot-candle power into profitable illumination with Pittsburgh Glorified Light Products.

The world's leading experts on light control have perfected three Glorified Light systems that convert raw light—both natural and artificial—into safe, efficient, practical illumination. Amazing results are accomplished by refinishing walls and ceilings with Pittsburgh Glorified Light Paints.

You'll find that the new lighting conditions brought about by these wonderful finishes will improve morale, reduce labor turnover, cut down accidents and speed up production *. . . at no increase in current costs.*

Find out how this great development in industrial lighting will affect *you.* Send today for our instructive book, "Glorified Light." It will show you many scientific short-cuts to more profitable production. Simply mail the coupon below for your free copy—*now.*

Pittsburgh Plate Glass Company, Paint Division, Pittsburgh, Penna.

Copr. 1937 Pittsburgh Plate Glass Co.

Three Ways to Use Glorified Light Products

THE SNOLITE SYSTEM—for all normal interior surfaces.

THE SNOTEX SYSTEM—for all abnormal interior surfaces except fungus growth. It resists discoloration from humidity, fumes, gases and lack of daylight.

THE FUNGUSIDE SYSTEM—to effectually retard the growth of fungus. It is valuable wherever bacteria and fungus must be continually combated.

PITTSBURGH PAINTS

Smooth as Glass

COMPLETE LINE OF STRUCTURAL MAINTENANCE FINISHES

SEND FOR THIS BOOK

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Paint Division, Dept. FM-9, Pittsburgh, Pa.
Please send me, free, your new book, "Glorified Light".

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* **No. 4 . .** ASSURANCE OF ACCO CHAIN QUALITY . . .

INSPECTION • link by link through every step of manufacture

• Sharp-eyed inspectors examine every link of ACCO Chain many times. After the link is formed, again after welding, after polishing, coating and testing, it must be minutely inspected. Trained inspectors, scientific lighting and a rigid penalty system combine to insure the thoroughness of ACCO inspection.

This thorough inspection is one of the *5 assurances of quality welded into every ACCO Chain. You can be certain of receiving high quality when you specify ACCO. You can be sure of getting *safe* chain.

We manufacture welded and weldless chain for any requirements. So don't just order chain. Buy ACCO Chain and *know* that you are getting good chain—safe chain.

*Behind ACCO Chain stand 5 assurances of quality—selected metals, precision forming, controlled electric machine welding, testing, inspection—plus years of experience in chain making.

AMERICAN CHAIN DIVISION
AMERICAN CHAIN & CABLE COMPANY, Inc.
BRIDGEPORT, CONNECTICUT

In Business for Your Safety

A FEW OF THE 137 AMERICAN CHAIN & CABLE INDUSTRIAL PRODUCTS

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AMERICAN CHAIN DIVISION
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Weed Tire Chains • Welded and Weldless Chain • Malleable Castings • Railroad Specialties

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ANDREW C. CAMPBELL DIVISION
Abrasive Cutting Machines • Floformers Special Machinery • Nibbling Machines

FORD CHAIN BLOCK DIVISION
Chain Hoists • Trolleys

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HIGHLAND IRON & STEEL DIVISION
Wrought Iron Bars and Shapes

MANLEY MANUFACTURING DIVISION
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OWEN SILENT SPRING COMPANY, Inc.
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Electric Steel Castings, Rough or Machined

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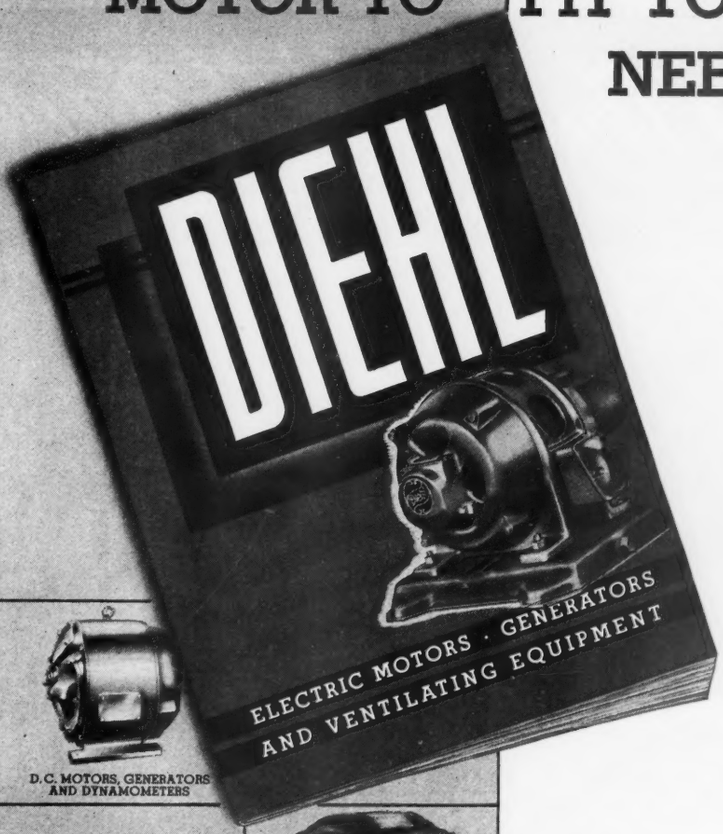
ACCO *Welded and Weldless* **CHAIN**

SELECT THE EXACT MOTOR TO FIT YOUR NEEDS

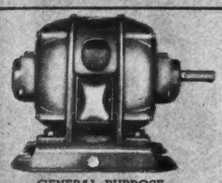


TYPICAL DIEHL APPLICATIONS

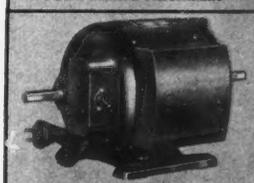
ADDING MACHINES
AIR CONDITIONING MACHINERY
AGITATORS
BAKERS' MACHINERY
BALANCING MACHINES
BATTERY CHARGING SETS.
BLOWERS
BOTTLING MACHINERY
CALCULATING MACHINES
CAMERAS & PROJECTING EQUIP'T
CANDY MAKING MACHINES
CANNING MACHINERY
CEMENT MAKING MACHINERY
CHEMICAL PLANT MACHINERY
CHURNS
CIGARETTE MAKING MACHINES
CIRCULATORS, AIR
CLAY MAKING MACHINES
COAL MACHINERY
COKE MACHINERY
COFFEE MACHINERY
COMPRESSORS
CONVEYORS
CRANES
DAIRY APPARATUS
DENTAL MACHINES
DISHWASHERS
DRIERS
ELECTRO-PLATING EQUIPMENT
ELEVATORS
ESCALATORS
FANS, EXHAUST
FIRE ALARM SYSTEMS
FLOUR MILL MACHINERY
FOOD PROCESSING MACHINERY
GENERATING EQUIPMENT
GLASS MAKING MACHINERY
GRINDING MACHINERY
HOISTS
HYDRAULIC MACHINERY
LAUNDRY MACHINERY
LOOMS, TEXTILE
MACHINE TOOLS
DRILL PRESSES
PUNCH PRESSES

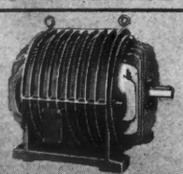
TYPICAL DIEHL APPLICATIONS

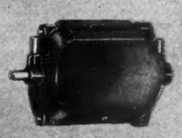
MACHINE TOOLS CONT'D
SHAPERS
GRINDERS
BORING MILLS
PLANERS
LATHES
SHEARS
BLANKING PRESSES
ETC.
METAL WORKING MACHINERY
MINING MACHINERY
MIXERS
MOTOR-GENERATOR SETS
OFFICE APPLIANCES
OIL BURNERS
OVENS
PAINT MAKING MACHINERY
PAPER MAKING MACHINERY
PETROLEUM PRODUCTS MACH'Y
POLISHING MACHINERY
POWER PLANT MACHINERY
POWER TABLES
PRINTING MACHINERY
PULVERIZERS
PUMPS
RECORDING INSTRUMENTS
REFRIGERATING MACHINERY
SCALES.
SEPARATORS
SEWING MACHINES
SHOE MAKING MACHINERY
SMELT'G & REFIN'G MACH'Y
SOAP MAKING MACHINERY
STOKERS, MECHANICAL
STONE WORKING MACHINERY
SUGAR REFINING MACHINERY
TABULATING MACHINES
TESTING MACHINES
TEXTILE MACHINERY
TYPEWRITERS
UNIT HEATERS
VACUUM CLEANERS
VENTILATING EQUIPMENT
WASHING MACHINERY
WINCHES
WOODWORKING MACHINERY

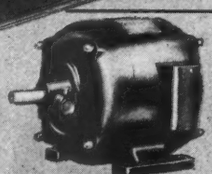

GENERAL PURPOSE SQUIRREL CAGE MOTORS

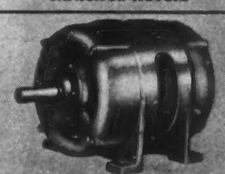
D.C. MOTORS, GENERATORS AND DYNAMOMETERS

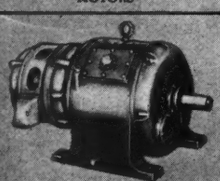

CAPACITOR MOTORS

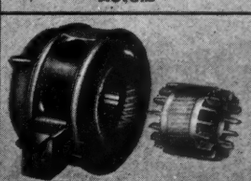

CHEMICAL PLANT MOTORS


A.C./D.C. UNIVERSAL MOTORS

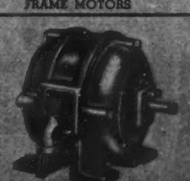

REPULSION START INDUCTION MOTORS

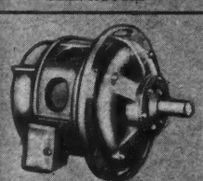

TEXTILE SPINNING FRAME MOTORS


GEAR MOTORS


SHAFTLESS MOTORS

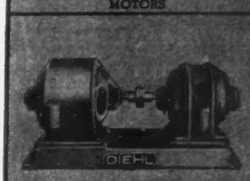
VERTICAL MOTORS—RING BASE


TEXTILE LOOM MOTORS

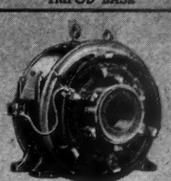

FLANGE TYPE MOTORS

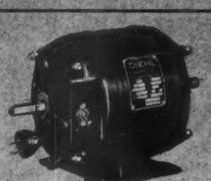
VERTICAL MOTORS TRIPOD BASE

SLIP RING MOTORS


MOTOR-GENERATOR SETS

DIRECT CURRENT MARINE MOTORS AND GENERATORS


D. C. ENGINE TYPE GENERATORS


SPLIT PHASE FRACTIONAL HORSEPOWER MOTORS

TOTALLY ENCLOSED FAN-COOLED MOTORS

Plant and product modernization demand the utmost in motor drive efficiency, economy and dependability. There is only one RIGHT motor to meet the requirements of each application.

The diversified Diehl line offers many types and sizes from which to select the exact motor to fit your needs. Standard motors are obtainable from stock for usual requirements. Special designs for exceptional conditions can be developed in a minimum of time. All are products of the same facilities and abilities which have enabled Diehl to design and produce motors that have satisfactorily met the requirements of exacting manufacturers in all branches of industry for half a century.

Tell us your requirements and our engineering staff will gladly recommend the proper motor equipment to meet your needs.

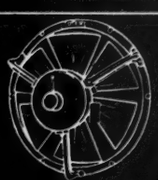
To all who use or choose motors the Diehl Catalog No. 1881 illustrated above will prove very helpful. Write for a copy.

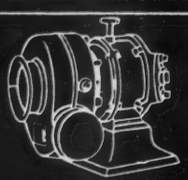
DIEHL MANUFACTURING CO., Elizabethport, N. J.
Pioneer Manufacturers of Motors, Generators and Fans
Electrical Division of THE SINGER MANUFACTURING CO.
ATLANTA BOSTON CHICAGO DALLAS NEW YORK PHILADELPHIA

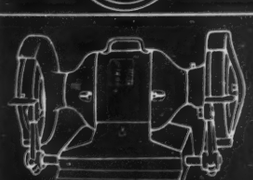
Diehl

DIEHL DESK AND BRACKET FANS

DIEHL AIR CIRCULATORS


DIEHL EXHAUST AND VENTILATING FANS


DIEHL PORTABLE VENTILATING SETS


DIEHL ELECTRIC GRINDERS

Plastics that Withstand

TEMPERATURES UP TO 500° F.

Appropriate present applications of High Heat Resistant Bakelite Molded are: ovenware knobs and bases, heater plugs and ovenware handles.

TO BROADEN the usefulness of Bakelite Molded in industry, Bakelite engineers have developed several special types of the material that stand up at even higher temperatures than the maximum at which standard thermo-setting plastics serve efficiently.

High Heat Resistant Bakelite Molded, for example, withstands exposure at 500° F., in contrast to General Purpose Bakelite Molded which is not recommended for temperatures over 300° F. Test samples of this improved material show a reduction in impact strength of only 5% from their original value, after 72 hours at 500° F.

Combined with this thermal endurance, *High Heat Resistant* Bakelite Molded possesses characteristic advantages of all Bakelite plastics: moldability; self-contained color and lustre; high weight-strength factor; and unusual resistance to moisture, common solvents and dilute acids and alkalis.

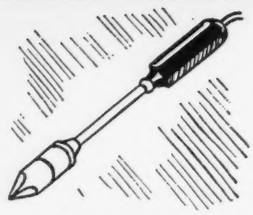
Designers, manufacturers and molders are urged to learn more about various heat-resistant and other special types of Bakelite Molded now available for improving design and performance of many products. Write for informative reference booklet 16M, "Bakelite Molded". At your request, our engineers will be glad to suggest appropriate types of Bakelite Molded for specific applications.

BAKELITE CORPORATION, 247 PARK AVENUE, NEW YORK, N.Y.
BAKELITE CORPORATION OF CANADA, LTD., 163 Dufferin Street, Toronto, Ont.
West Coast: Electrical Specialty Co., Inc., 316 Eleventh Street, San Francisco, Cal.

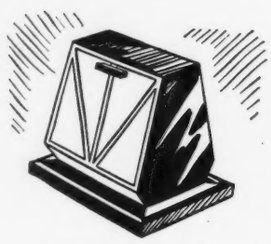
BAKELITE

REGISTERED U. S. PAT. OFF.

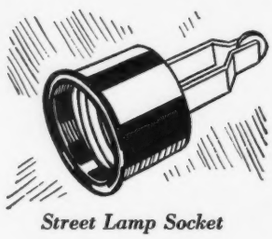
The registered trade marks shown above distinguish materials manufactured by Bakelite Corporation. Under the capital "B" is the numerical sign for infinity, or unlimited quantity. It symbolizes the infinite number of present and future uses of Bakelite Corporation's products.



Soldering Iron Handle



Complete Electric Toaster Frame



Street Lamp Socket

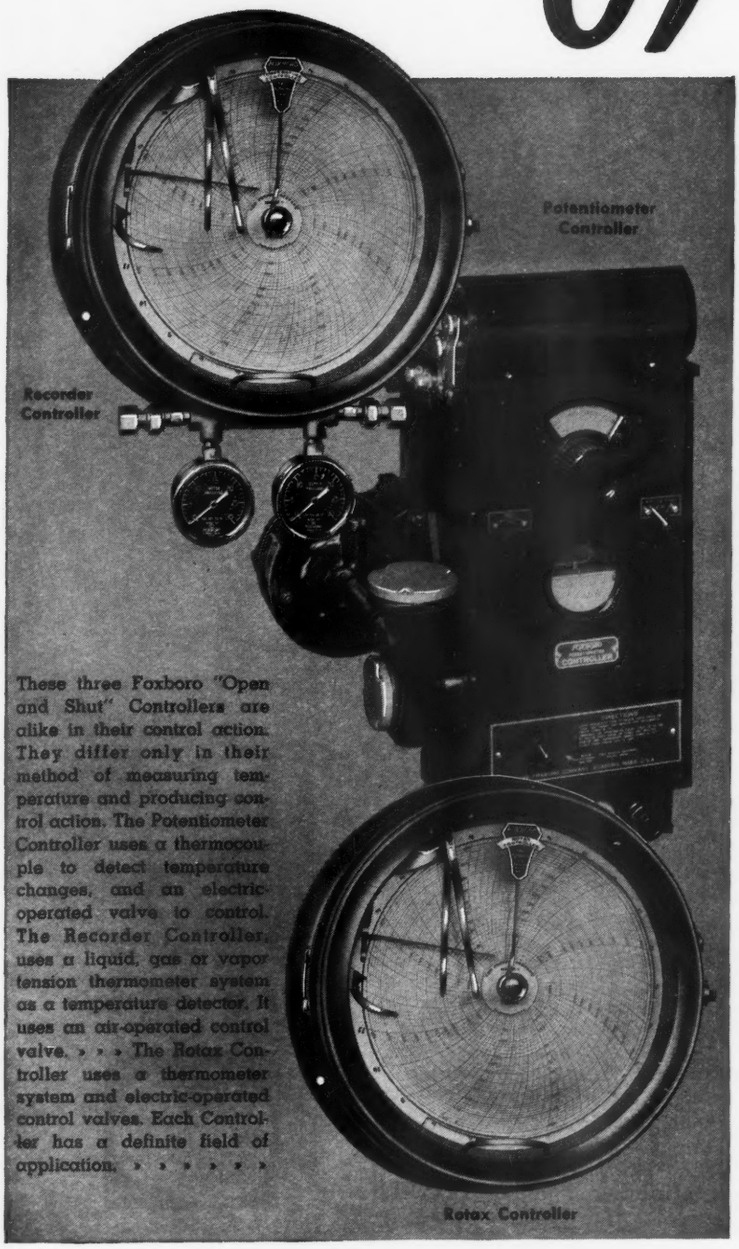
Lighting Reflector

Coffee Brewer Base

Above are suggested applications for which High Heat Resistant Bakelite Molded offers advantages.

THE MATERIAL OF A THOUSAND USES

NATURE MADE 65% OF ALL TEMPERATURE CONTROL PROBLEMS SIMPLE



These three Foxboro "Open and Shut" Controllers are alike in their control action. They differ only in their method of measuring temperature and producing control action. The Potentiometer Controller uses a thermocouple to detect temperature changes, and an electric-operated valve to control. The Recorder Controller, uses a liquid, gas or vapor tension thermometer system as a temperature detector. It uses an air-operated control valve. » » » The Rotax Controller uses a thermometer system and electric-operated control valves. Each Controller has a definite field of application. » » » » » »

...from boiling a ham to annealing the giant 200-inch glass disc

FOXBORO OPEN-SHUT CONTROL IS BEST

Strange . . . but true! And fortunate is this whim of Mother Nature. It means that for 65% of all temperature control problems "the simplest Controller is the best" that nothing will produce better control than you will get with a simple Foxboro "Open and Shut" Controller—regardless of price. In most cases no other form of control will work as well.

"Most" temperature control jobs have large heat capacity, and direct heat transfer. That's the 65% . . . the kettles, kilns, ovens, cookers, pickling tanks, and the like. That's the type Foxboro has been handling for twenty-four years with the "open and shut" type of Control. It has generated an unequalled store of experience—which is at your service.

On millions of chart records this verdict has been written: "Foxboro 'Open and Shut' Controllers give unbeatable control." But whatever your control problem, have a Foxboro representative survey your needs. You may save money and get better results. The Foxboro Company, 24 Neponset Avenue, Foxboro, Massachusetts, U. S. A. Branch Offices in 25 Principal Cities.

35% require other types of Foxboro Controllers. Eight years ago the Stabilog Controller was perfected to meet specific problems involving varying amounts of throttling range . . . the 35% that cannot be handled by "open and shut" control. Bear in mind, the "open and shut" type of Controller and the Stabilog Controller each has its individual use. They are not interchangeable . . . and neither supplements the other.

FOXBORO
REG. U. S. PAT. OFF

Certified TEMPERATURE CONTROLLERS
RESPONSE · ACCURACY

AIR wrapped in cellophane . . .

couldn't be cleaner than the air delivered by Coppus Air Filters. To remove harmful dust, improve working conditions, protect product purity, recover valuable substances, etc. . . . put Coppus Air Filters on the job.

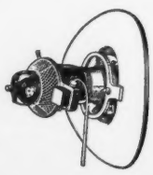
Dust arrestance: 95.6% efficient for 2 micron size dust (.00008 inch) — highest of any commercial filter.

Non-clogging: Wide pocket areas — no restriction to air flow — no clogging.

Skyscraper frame: Built to last. No wires. Minimum number of welds. Vibration-proof.

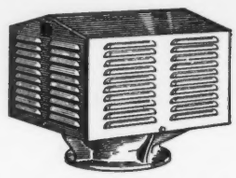
No maintenance required: Dry-type filter element — no oil to fill with dirt and require frequent cleaning.

In manholes or in *any* confined working space: tunnels, pipe galleries, coal pockets, process tanks, storage bins, etc., the *Cable Manhole Ventilators* (Bulletin 163).

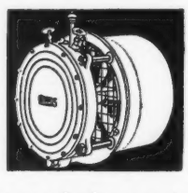


For rapid cooling and ventilating of boilers, tanks, retorts, etc., the *Boiler Manhole Blower* (Bulletin 161-3).

For directing a flow of cool air upon workmen (also cooling off furnaces, ventilating motors, generators, etc.), the *Heat Killer* (Bulletin 160-4).



★ Attached to the intake of air compressors and engines, the Coppus Air Filter provides clean air, free from abrasive dust particles. (Bulletin F-310-3.)



★ To increase boiler capacity or to improve draft conditions, the *Forced Draft Blower* (Bulletin 145-5).

FRESH AIR FOR MEN AND MACHINES COPPUS

There is a Coppus Filter to suit your plant's individual needs. Write Coppus Engineering Corporation, 375 Park Ave., Worcester, see listing in THOMAS' REGISTER. In SWEET'S — Air Filters for air compressors and engines, Blowers, Heat Killers, Mine Ventilation Equipment, Steam Turbines.

COPPUS AIR FILTERS PASS CLEAN AIR

7535

All Around the Country Industry Turns to DUM DUM MASONOC

A FOOD MANUFACTURER in Michigan... a public utility in the nation's capitol... a giant East Coast plant... these are only a few of the many large industrial establishments, over this entire country, which have found in DUM DUM MASONOC the answer to the problem of preserving and restoring above-grade surfaces of concrete, stucco and masonry.

BRIDGES AND FILLS CRACKS

Over a 25-year period, DUM DUM MASONOC has proven that it is the ideal agent for the restoration and preservation of exterior concrete, masonry and stucco surfaces. It fills and bridges the fine cracks and pores which give deterioration a foothold. Its elastic under-surface permits DUM DUM MASONOC to expand and contract with movement and temperature changes, tending to prevent the formation of new cracks. Applied in a coat many times the thickness of paint and possessing the power to heal its own surface injuries, DUM DUM MASONOC gives protection indefinitely.

If you are faced with the problem of restoring or preserving above-grade concrete, masonry or stucco surfaces, you, too, will probably find the answer in DUM DUM MASONOC. Send for a recently issued FREE booklet which describes this product in detail. Address Dept. F9, The Arco Co., Cleveland, Ohio.

DUM DUM MASONOC

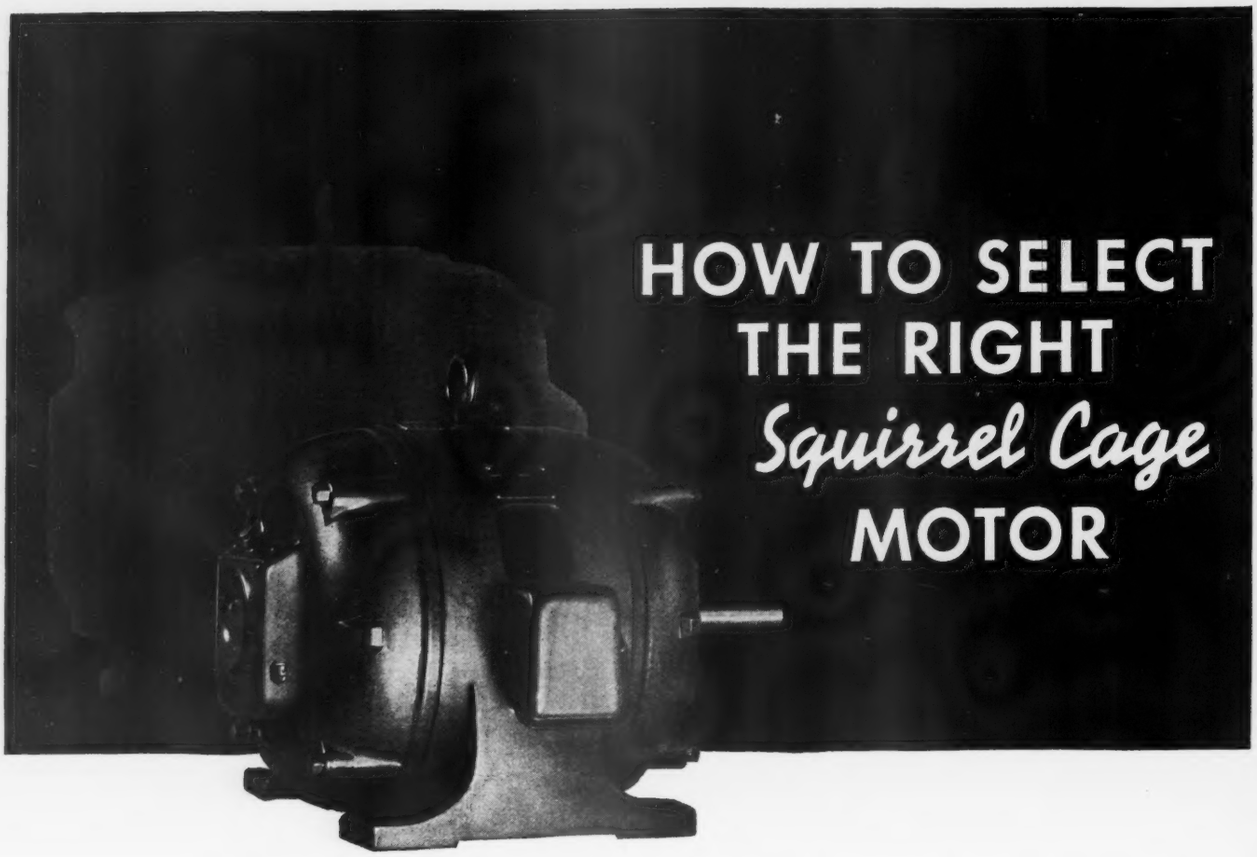
rubbery, semi-plastic decorative coating for weather-proofing above-grade concrete, stucco and masonry surfaces.

THE ARCO COMPANY

PAINTS • VARNISHES • LACQUERS • ENAMELS

CLEVELAND, OHIO — LOS ANGELES, CALIF.

SPECIALTY ARCO Established 1881



HOW TO SELECT THE RIGHT *Squirrel Cage* MOTOR

Each one of the four distinct types of Squirrel Cage Motors built by Century is designed with individual characteristics that are best adapted to economically meet the starting and running requirements of the driven load.

Type SC... *Normal Starting Torque—Normal Starting Current*... Balanced design—no one characteristic is over developed at the expense of another. The popular motor for general purpose applications—particularly for precision machine tools.

Type SCN... *Normal Starting Torque—Low starting Current*... This type motor is popular for general purpose applications where it is necessary that across-the-line starting current be within N. E. M. A. and E. E. I. limits.

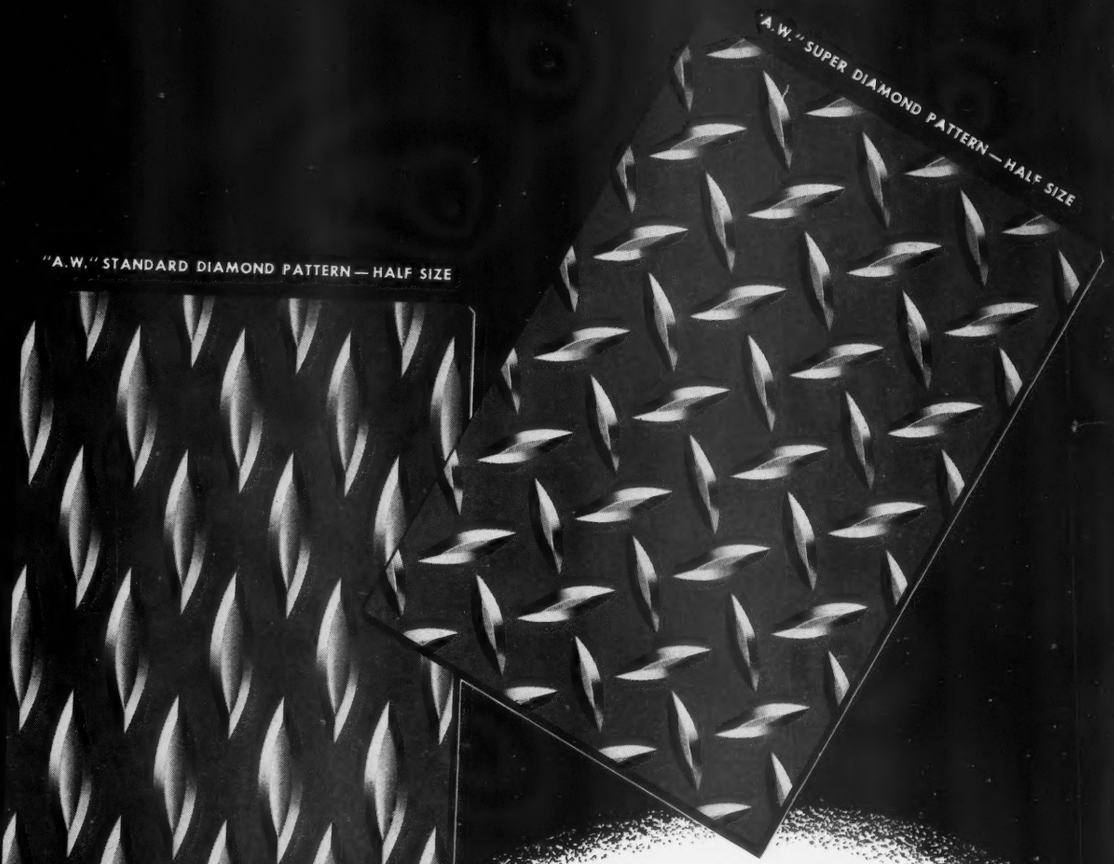
Type SCH... *High Starting Torque—Low Starting Current*... This motor is popular for driving hard to start loads such as Freon Refrigeration Compressors, Plunger pumps, etc., with starting current across-the-line within N. E. M. A and E. E. I. limits.

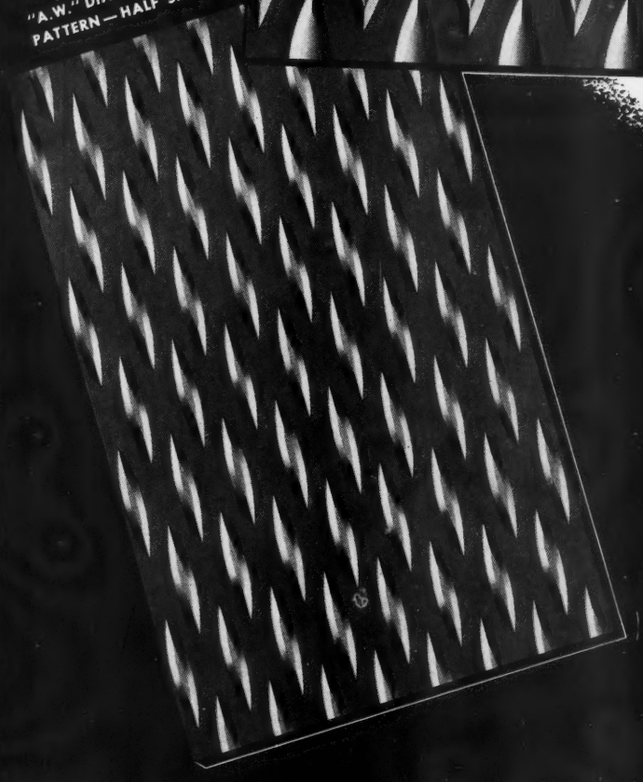
Type SCT... *High Torque—High Slip*... For high inertia, and other industrial loads such as Punch Presses, shears, slotters, cranes, hoists, gates. They can all be furnished in open, splashproof, or totally enclosed construction.

Century Engineers will answer your questions about selecting the right motor to meet your load requirements and prove most economical in the long run. More than 34 years' experience plus thorough knowledge of application requirements.

CENTURY ELECTRIC COMPANY
1806 Pine Street • • • St. Louis, Missouri
Offices and Stock Points in Principal Cities

Century MOTORS





ROLLED FLOOR **AW** STEEL PLATE

Specify for Safety

The principal result you gain from any "A.W." Rolled Steel Floor Plate pattern you install, is of course *Safety for busy workers.* But here are others:

You gain a **PERMANENT** installation at amazingly low first cost—and you eliminate all upkeep cost. Installation is quick, and need not interfere with men or production. "A.W." Floor Plate is cut to any required shape and easily matched. As readily applicable to new construction as to replacement or repair work. A sanitary flooring which drains quickly—which is heat proof, crack proof, oil proof.

Write for newly revised literature—just issued—showing five "A.W." Floor Plate patterns to meet all needs, and giving complete engineering data.

ALAN WOOD STEEL CO.

ALAN WOOD STEEL CO. ESTABLISHED "A.W." TRADE MARK 1826 CONSHOHOCKEN PA.

CONSHOHOCKEN, PA.

Branches: Philadelphia, New York, Boston, Detroit, Los Angeles, San Francisco, Seattle, Houston

111 YEARS' IRON AND STEEL MAKING EXPERIENCE

HOW WOULD YOU LIKE TO BE "Holding the Bag" WHOLESALE?

When a shipment of paper bags are returned "No good — can't use — what about it" you can generally blame the weather. For climate has a direct bearing on the successful production of even a paper bag. Machines, paper stock and glue come under the climate's spell.

But some paper bag manufacturers—like many bakers, brewers, canners, hatters — have got the weather licked. By installing Certified Climate in their plants they keep atmospheric conditions uniform. They do away with the changes in air that cause seconds, rejects, losses.

Parks Engineers have helped these manufacturers find their perfect climate. In hundreds of plants — large and small — Parks Engineers have gone in, studied problems, and produced, the Certified Climate that was best for each specific job.

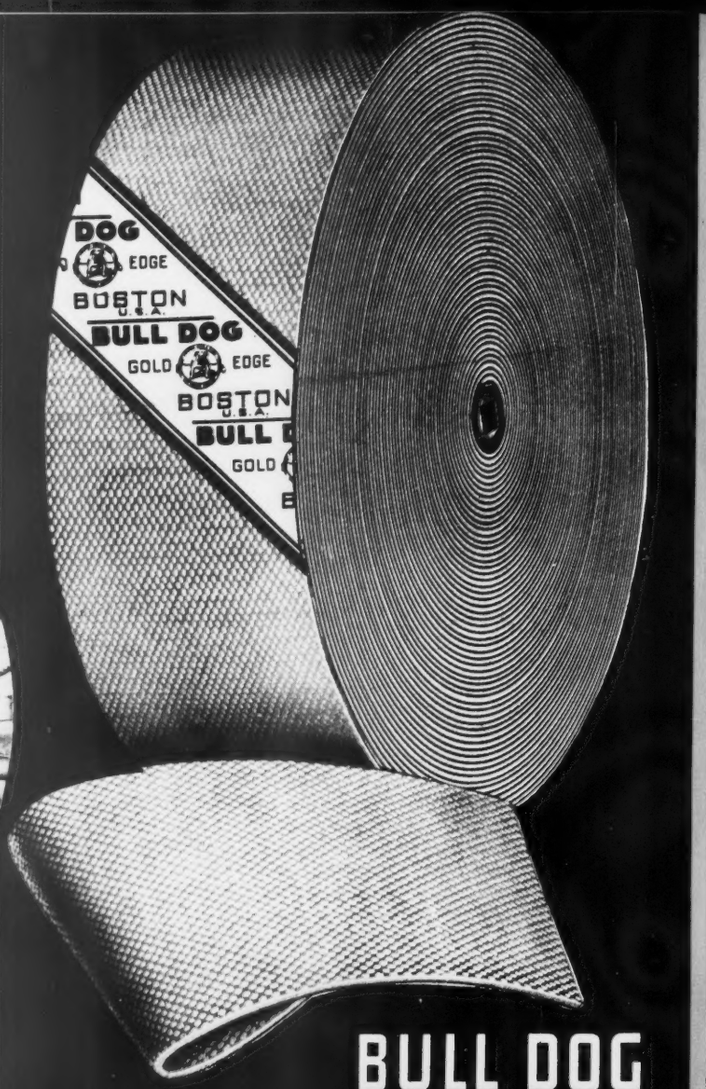
Perhaps your product has a climate complex. Perhaps Certified Climate can step up your production and cut your manufacturing costs. Find out for sure. Have a Parks Engineer call. No obligation. Write.

PARKS

Certified Climate

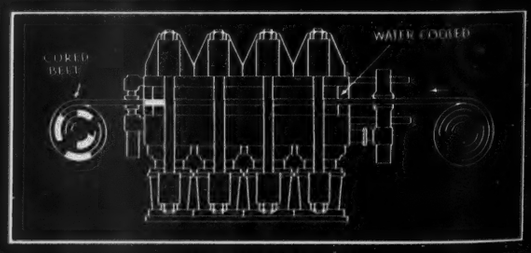
PARKS-CRAMER CO., FITCHBURG, MASS. . . . CHARLOTTE, N. C.

NEW
VALUES
The
ROTOCURE PROCESS
of
CONTINUOUS
VULCANIZATION
BWH
RUBBER TRANSMISSION
BELTS



BULL DOG
Gold Edge

The Old Way



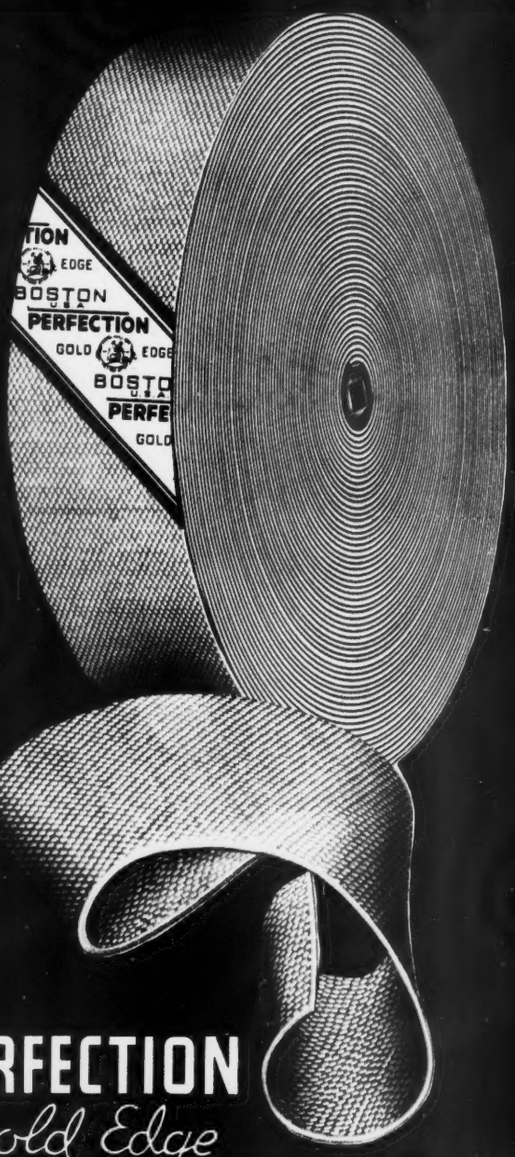
INTERMITTENT JAW PRESS

For many years rubber transmission belting has been habitually bought in three ways—

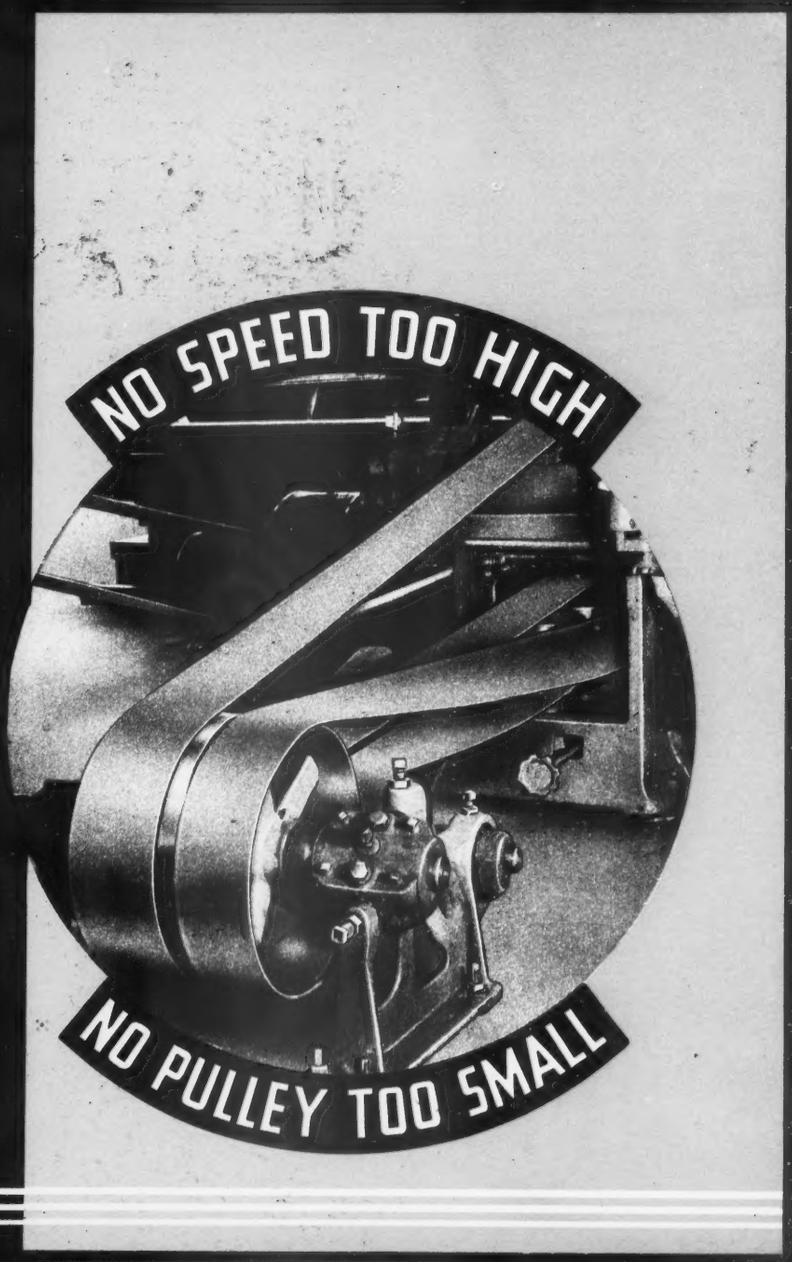
1. **By name**
2. **By type**
3. **By size**

Today, however, belt users must measure belt value by the process used in vulcanizing because a new and better method of making rubber transmission belting has been created.

BOSTON WOVEN HOSE & RUBBER CO



PERFECTION
Gold Edge



CONTINUOUS ROLL BELTING VULCANIZER

The New Way

B.W.H. at its plant in Cambridge, Mass. has developed the Rotocure Process of Continuous Vulcanization, discarding the old-fashioned flat press which produced a doubly vulcanized overlap in every 30 feet of the belt. B.W.H. belts are now cured without press overlaps or press marks,—no undercure or overcure at any point. Variation is no longer a problem. If you are not familiar with Continuous Vulcanization, write immediately for our booklet on the subject.

CO. — BOSTON, MASS., U.S.A.

EXTRA SERVICE

Continuous and progressive research throughout sixty years of manufacturing experience has resulted in contributions so outstanding in their service to industry that the B.W.H. brand on Mechanical Rubber Goods is now synonymous with the words "extra service".

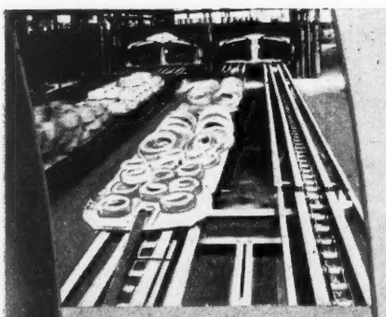
The Rotocure Process of Continuous Vulcanization is another milestone in the B.W.H. march of progress. Boston Woven Hose products are always identified by this trade mark —

BOSTON WOVEN HOSE TRADE MARK AND RUBBER COMPANY

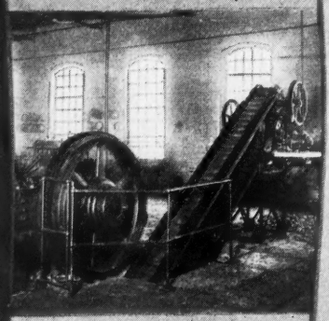
AND THE INITIALS

BWH

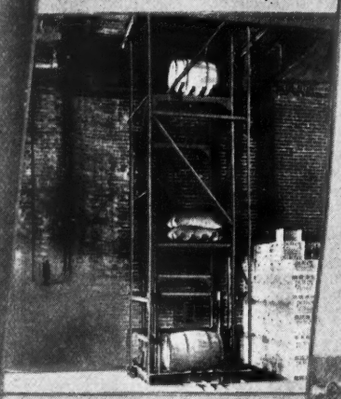
Works of the Boston Woven Hose & Rubber Company, Cambridge, Mass., U. S. A.



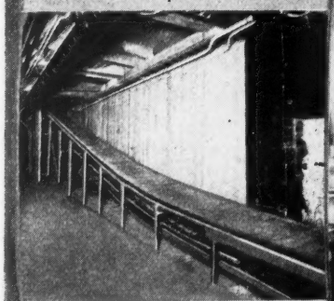
G-W Oven Conveyors



G-W Rivet Conveyor



G-W Tray Elevator



G-W Wood Slat Apron Conveyor

G-W Belt Conveyor

HANNIBAL'S ELEPHANTS WERE ULTRA-MODERN MATERIAL HANDLING EQUIPMENT

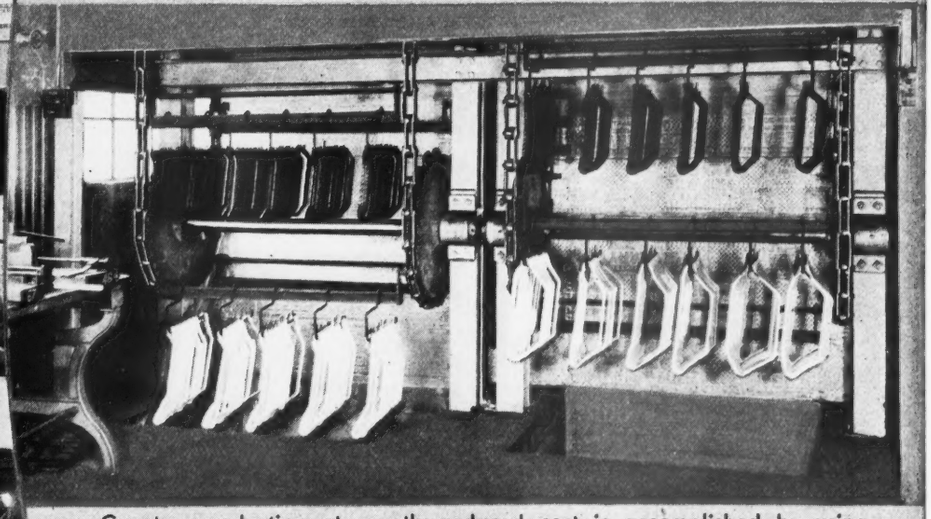
when he crossed the Alps with his armies in 218 B. C.

Though far from modern now, there are still lots of elephants—white elephants—in American factories where Gifford-Wood material handling equipment would speed production, save space, avoid congestion, reduce costs.

Whatever you regularly move in quantity from place to place, you will find Gifford-Wood can design and produce for you a most efficient and dependable material handling system.

G-W equipment for the mechanical handling of materials is applicable to practically every phase of industrial activity. It is used by many noted concerns for handling bulk raw materials during preparation, storage, reclaiming and shipping; at the plant for unloading, storing and handling; for packaged goods in packing, assembling, storage and transportation; for unloading, storing and reclaiming of coal and the removal of ashes. Many special handling systems involving peculiar or unusual conditions have been successfully solved by Gifford-Wood engineers. Why not consult them? No obligation will be imposed on you.

A new catalogue has just been issued. Write for a copy.



Greater production at greatly reduced cost is accomplished by using Gifford-Wood conveyors for carrying coils through the process of applying insulating varnish at the Schenectady plant of the General Electric Co.

GIFFORD-WOOD CO.

OPERATING C. W. HUNT CO. DIVISION

565 W. Washington St. Chicago — HUDSON, N. Y. — Graybar Building New York

7081

To Industry MEDART *brings*

REDUCED FRICTION LOSSES!

Save power transmission dollars and increase your production efficiency by reducing friction losses with Medart-Timken Pillow Blocks, Hanger Bearings, Flange Units and Unit Mounts.

Easy to install and remove—no attention required after installation, except occasional lubrication ... Sealed against leakage of lubricant—dirt cannot enter the housing ... Completely assembled and lubricated before shipment!

Furnished in 4 types: For General Purpose Applications ... For High Speeds and Shock Loads ... For Conveyor and Machinery Applications ... For Light Duty General Purpose Applications.

THE MEDART COMPANY

General Offices & Works: 3512 DeKalb St., St. Louis, Missouri

Engineering Sales Offices: Cincinnati • Cleveland • New York • Buffalo Philadelphia • Chicago • San Francisco • Los Angeles • Dallas • Charlotte Pittsburgh • Birmingham • New Orleans • Denver • Milwaukee

MEDART
V-BELT DRIVES

For uniform drives, positive speeds, reduced belt expense, extra flexibility, long life and short-center drives —use Medart V-Belt Drives... Also Steel and Cast Iron Sheaves and V-Belts in all sizes.

MEDART

GET CATALOGS

★ Electroforged, one piece construction—strongest by test.

★ Safest footing because of the twisted bar.

★ Self-cleaning, no sharp corners to clog with debris.

★ Maximum open area for light and air.

★ Easily maintained. No cracks or crevices; paint reaches entire surface.

Examine **A SAMPLE**

Know the FIVE Superior points

★

BLAW-KNOX

Electroforged

STEEL GRATING

CLIP AND MAIL THIS COUPON

BLAW-KNOX CO. 2031 FARMERS BANK BLDG., PITTSBURGH, PA.

Send Grating sample to

NAME _____ COMPANY _____

STREET _____

CITY _____ STATE _____

A home may be ever so attractive and modern, yet if it has a yard which is poorly kept, it will not be admired.

Business, of course, is run for profit rather than for the admiration of friends. But, even the most modern shops and the most efficient machinery are often heavily penalized by the improper flow of incoming and outgoing materials through a poorly arranged yard.

As an important part of their crane selling jobs, Industrial Brownhoist sales engineers have helped in the planning and rearranging of thousands of yards. If your yard costs and layout have not received the attention they deserve, take along an Industrial Brownhoist representative and have a look at them. It's an almost sure way of cutting today's mounting production costs.

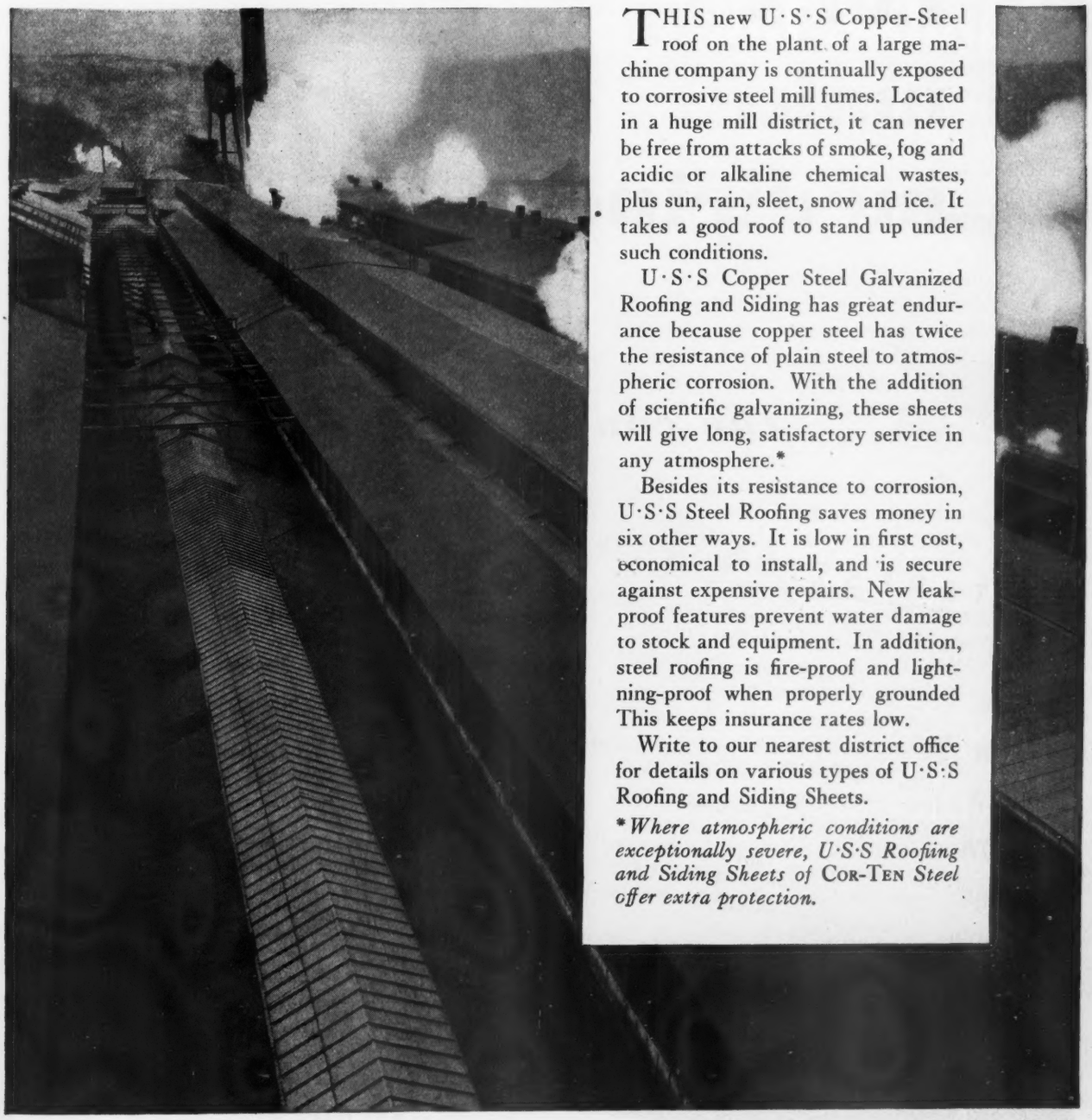
INDUSTRIAL BROWNHOIST

GENERAL OFFICES: BAY CITY, MICHIGAN
NEW YORK, PHILADELPHIA, CLEVELAND, CHICAGO

Locomotive Cranes
Crawler Cranes
Erection Cranes
Wrecking Cranes
Bridge Cranes
Pile Drivers
Dock Machinery
Buckets

DOWN BY THE STEEL MILLS

is a **TOUGH** *place for Roofing*



THIS new U·S·S Copper-Steel roof on the plant of a large machine company is continually exposed to corrosive steel mill fumes. Located in a huge mill district, it can never be free from attacks of smoke, fog and acidic or alkaline chemical wastes, plus sun, rain, sleet, snow and ice. It takes a good roof to stand up under such conditions.

U·S·S Copper Steel Galvanized Roofing and Siding has great endurance because copper steel has twice the resistance of plain steel to atmospheric corrosion. With the addition of scientific galvanizing, these sheets will give long, satisfactory service in any atmosphere.*

Besides its resistance to corrosion, U·S·S Steel Roofing saves money in six other ways. It is low in first cost, economical to install, and is secure against expensive repairs. New leak-proof features prevent water damage to stock and equipment. In addition, steel roofing is fire-proof and lightning-proof when properly grounded This keeps insurance rates low.

Write to our nearest district office for details on various types of U·S·S Roofing and Siding Sheets.

**Where atmospheric conditions are exceptionally severe, U·S·S Roofing and Siding Sheets of* COR-TEN *Steel offer extra protection.*

U·S·S BLACK *and* GALVANIZED SHEETS

CARNEGIE-ILLINOIS STEEL CORPORATION · *Pittsburgh and Chicago*
COLUMBIA STEEL COMPANY · *San Francisco*
TENNESSEE COAL, IRON & RAILROAD COMPANY · *Birmingham*

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* . United States Steel Products Company, New York, *Export Distributors*

UNITED STATES STEEL

Let's make medicine

the council fire is lit . . .

INTERESTING HOWS

HOW the Industrial Advertising Manager Can Function in His Public Relation Program.

HOW to Evaluate Publications—Methods of Qualitative and Quantitative Analysis

HOW to Use and Not to Use Industrial Motion Pictures

HOW to Develop and Maintain Industrial Mailing Lists

HOW to Secure Greater Effectiveness from the Advertising Dollar

HOW to Organize and Carry on Market Research Activities and How to Apply the Facts

HOW to Apply Showmanship and Add Sales Power to Industrial Copy

HOW to Write Better Letters and Use Them More Effectively

HOW! BROTHER

By smoke writing and carrier pigeon—by swift runner and heliograph, word has reached the council fire that the braves of many tribes are on the march and will assemble in full force at the big 15th Annual Pow-wow of the NIAA, September 22, 23, 24, at Chicago.

Important plans will be discussed—extensive exhibits of successful advertising and sales promotional material displayed and valuable "Hows" presented by industrial sales and advertising directors.

Of course, pleasure has had its full consideration—banquets, night clubs, bathing, golf—and bows and arrows for those who prefer.

Mr. H. D. Payne, Chairman, 2145 Walnut Street, Chicago, Ill., will gladly accept your reservation or send further information—write him.

Prepared by The Buchen Company, Chicago

NIAA

15TH ANNUAL ADVERTISING AND SALES PROMOTION CONFERENCE AND EXPOSITION
EDGEWATER BEACH HOTEL, CHICAGO
SEPTEMBER 22, 23, 24, 1937

This is the material that ends "Interest Payments" on your Roofing and Siding!

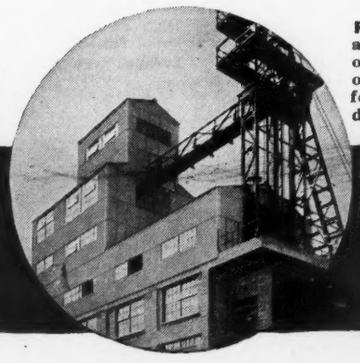
CORRUGATED TRANSITE is a different material. It is not new. For twenty years now it has protected the roofs and sides of buildings, under the most varied and grueling service conditions known to industry.

Probably it is like no other material you have ever known. A product of Johns-Manville research, Corrugated Transite is formed of asbestos and cement, molded under terrific pressure. The inherent advantages of these two imperishable materials are the advantages of this product. Resistance to fire and corrosion, immunity to rot or decay, imperviousness to weather and temperature change.

No wonder, then, that this material was sought out . . . put into service by the chemical industry, the public utilities, the oil refineries. Any material that can survive the operating conditions encountered in these industries is a material whose durability is unquestionable.

• • •

Your own conditions may be equally severe. Maintenance may have taken a "mortgage" on your roofing and siding. May now be exacting heavy "interest" payments every year. If so, all the more reason for getting all the facts on J-M Corrugated Transite. A new brochure incorporating construction details is now available. Simply write Johns-Manville, 22 East 40th Street, N. Y. C.



RAPIDLY APPLIED on any skeleton-frame structure with as much ease as wood or metal, Corrugated Transite is one of the most economical building materials now offered for industrial use. And once erected—you can forget it. Exceptionally durable, it is unaffected by rot, deterioration or weather conditions!

Johns-Manville CORRUGATED TRANSITE ROOFING AND SIDING

They're Both Internal Grinding . . .

And There's a Norton Wheel for Each!

YOUR internal grinding job may not be as big as the railroad shop operation above nor as small as the tool room job below—but, large or small, you can be sure that there's a Norton Wheel to do it *right*.

NORTON COMPANY, WORCESTER, MASS.

New York Chicago Detroit Philadelphia Pittsburgh
Hartford Cleveland Hamilton, Ont. London Paris
Wesseling, Germany Corsico, Italy

NORTON ABRASIVES

NOW 22% MORE LIGHT FROM THESE NEW...

Your lighting dollar buys more than ever before. The new 350-watt Cooper Hewitt gives the same amount of light as the former 450-watt unit. You can run more lamps per circuit. They have high power factor, instant starting and hang horizontal to give the best light distribution.

These new "24-hour skylights" assure an ease of seeing, even in the most difficult places, that benefits both worker and manufacturer. The soft, detail-revealing light does not fatigue the eyes. It promotes better work and minimizes errors.

Have our nearest representative survey your needs. It places you under no obligation. He will give you the facts about the light which is enjoyed by more than a million workers and their employers. A letter will receive our immediate attention.

General Electric Vapor Lamp Company, 815 Adams Street, Hoboken, New Jersey.

"Better than daylight" is truly descriptive of the 24-hour a day detail-revealing light of the new Cooper Hewitt lamps. Eye-fatigue is banished. A uniformly better workmanship is assured. This modern light is truly a profitable aid to greater manufacturing efficiency.

By adding incandescent lamps to the mercury within the fixture, lighting is obtained that closely resembles daylight values for operations that require perception of color.

GENERAL ELECTRIC VAPOR LAMP COMPANY

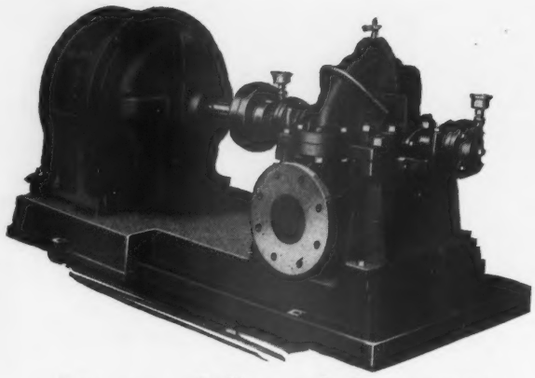
832C

Performance Guaranteed

We could write at great length on the mechanical and engineering details that contribute to the successful and economical operation of "Buffalo" Pumps throughout industrial America.

However, we believe, you as a prospective purchaser of pumps to solve your particular problems, are much more interested in how "Buffalo" Pumps will perform when under actual operating conditions in your plant.

Therefore, we say this to you. Tell us what *your* pumping problem is. Tell us what performance you expect, and our engineers will recommend the right "Buffalo" Pumps for the job and will "guarantee their performance" based on those recommendations.



So why take chances on so important a piece of equipment when you can be sure of having the performance and trouble-free operation you want by specifying "Buffalo" "Performance Guaranteed" Pumps.

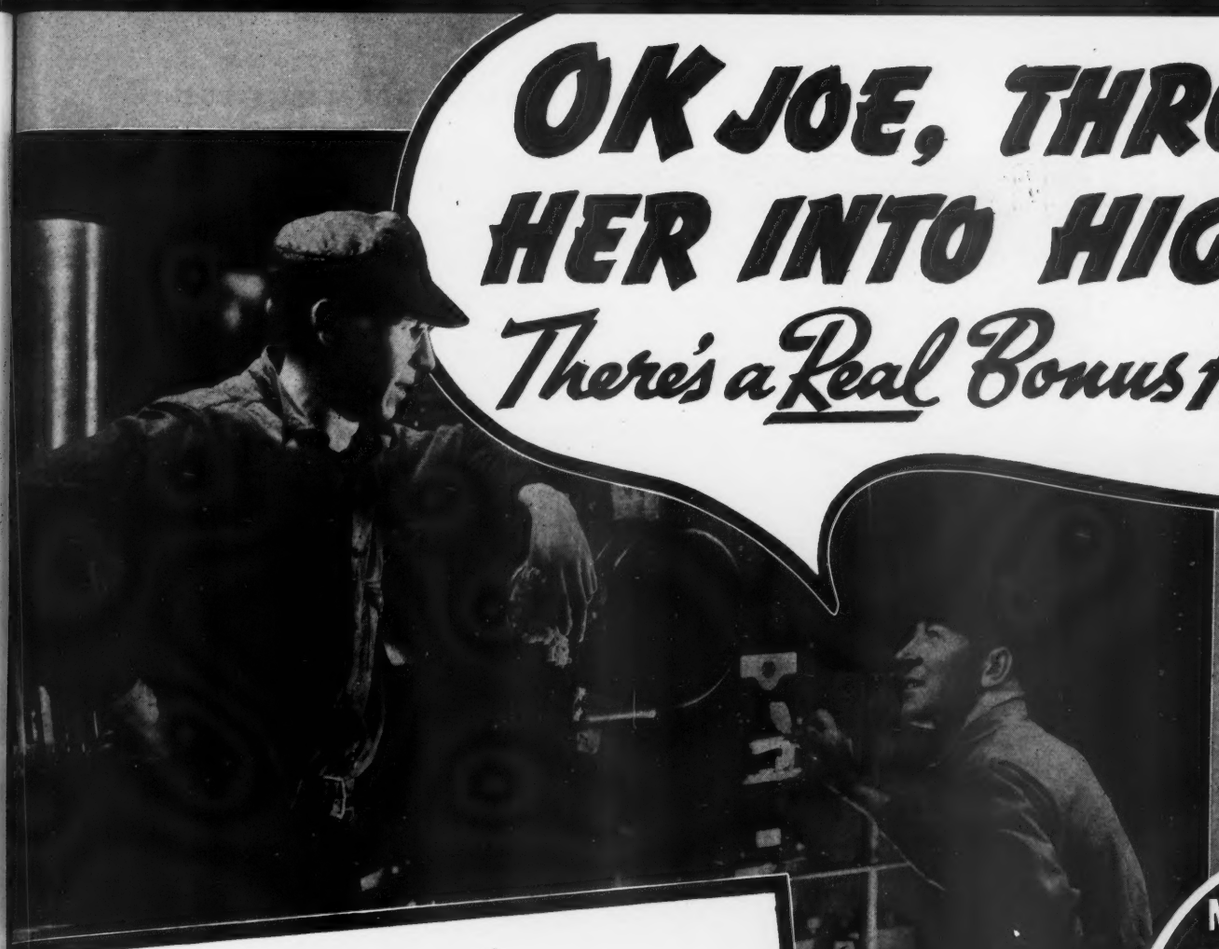
Literature gladly supplied on request.

BUFFALO PUMPS, INC.
471 Broadway, Buffalo, N. Y.
Branch Engineering Offices in Principal Cities
In Canada: Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo" **BALL BEARING PUMPS**
for every Industrial Need

OK JOE, THROW HER INTO HIGH...

There's a Real Bonus Help!



"You won't have to wait around for me to run over and stick a new fuse in every time you take too deep a cut. Now you can get going again just by easing off the load and moving this handle back to "ON."

"This Nofuze Breaker is trip-free -- you can't hold it shut against a dangerous overload. It's permanently sealed, can't be bridged or blocked. That's why it's perfectly safe for you to restore service yourself."

NOFUZE "DE-ION" CIRCUIT BREAKERS
100% Safety
PLUS
Important Savings

● Westinghouse Nofuze Circuit Breakers capitalize on the exclusive Westinghouse "De-ion" principle of arc quenching. They make possible greater SAFETY for men, machines, and circuits than any other method of circuit protection.

Substantial savings are realized by companies using them. They eliminate loss of time for men and machines; losses that occur when replaceable protective devices are depended upon. Frequently they save more than their cost in a few weeks. Investigate in your own plant the possibilities for increased safety that quickly pays off the investment. Call your: J 20305

WESTINGHOUSE OFFICE
INDUSTRIAL AGENT
ELECTRICAL WHOLESALER
MOTOR DEALER

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

Westinghouse

NOFUZE "DE-ION" CIRCUIT BREAKERS

$15 NOFUZE CIRCUIT BREAKER *Saving* $60 PER WEEK!

● A shaker screen in an Illinois paper mill is driven by a 7½-hp. D-c. motor. When this motor was protected by fuses, production was delayed three or four times each week because of fuse outages. A $15 Nofuze breaker has eliminated these delays. According to the plant management, it saves at least $60 per week in time that was formerly lost by men and the paper making machine.

Engine-cylinder forgings by the Lycoming Division of Aviation Manufacturing Corporation and Homo Furnace in which these Hump-hardened parts are tempered.

A Twin Problem . . .

HARDENING & TEMPERING . . . SOLVED BY HUMP & HOMO FURNACES

Requiring the finest possible heat-treat for airplane-engine parts of alloy-steel, the Aviation Manufacturing Corporation, Lycoming Division, at Williamsport, Pa., relies entirely on Vapocarb-Hump Hardening and Homo Tempering Furnaces.

Normalizing is done in either, depending on Temperature and nature of furnace atmosphere desired. From either Furnace, forgings emerge as nearly "dead soft" as such high-physical alloys can be, and with smooth, even texture that facilitates high-grade machining.

Hardening is always in the Vapocarb-Hump Furnace. Leaving without a trace of scale, with no pits or decarburization, the parts show no unexpected change in dimension. And each has precisely the desired structure, with intense and highly uniform hardness.

In Homo Furnaces, the inherently perfect controls of time and temperature permit hardness to be drawn accurately and uniformly. Any specified balance is secured between hardness on the one hand, toughness on the other.

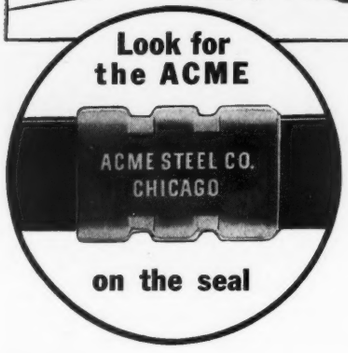
J-T-02 (2)

LEEDS & NORTHRUP COMPANY, 4921 STENTON AVE., PHILADELPHIA, PA.

LEEDS & NORTHRUP

MEASURING INSTRUMENTS · TELEMETERS · AUTOMATIC CONTROLS · HEAT-TREATING FURNACES

Doc. Steelstrap's REDUCING SYSTEM



MAKES SHIPPING COSTS MORE ATTRACTIVE

● For years Doc. Steelstrap has successfully performed the interesting operation of reducing shipping costs, by large percentages. Hundreds of concerns nave accepted his diagnosis and used the prescribed treatment.

The important, money-saving benefits of the cost reducing system are derived simply by correctly applying ACME Steelstrap to the carton, box, bundle or crate. This procedure enables the reduction of materials, weight, labor and time. And the contents are more securely protected by a stronger container.

If you could do it economically—at an exceptionally low initial cost—would you be interested in reducing *your* shipping expense by 10%—20% or possibly 50%? How much would that add to your profit in 5 years? Doc. Steelstrap will be glad to help you determine the exact amount without any obligation on your part.

"My Second Strap-Book" is a new illustrated booklet that gives complete information about reducing shipping costs with Acme Steelstrap—the treatment and some of the results. Practically every type of product can be shipped more economically with Acme Steelstrap. Just mail the coupon for your free copy.

ACME STEEL COMPANY
GENERAL OFFICES:
2831 Archer Avenue, Chicago, Ill.

Branches and Sales Offices in Principal Cities

ACME STEEL COMPANY, 2831 Archer Ave., Chicago, Ill.
☐ Mail a Free copy of "My Second Strap-Book."
☐ Mail full particulars about a free "diagnosis" by Doc. Steelstrap.

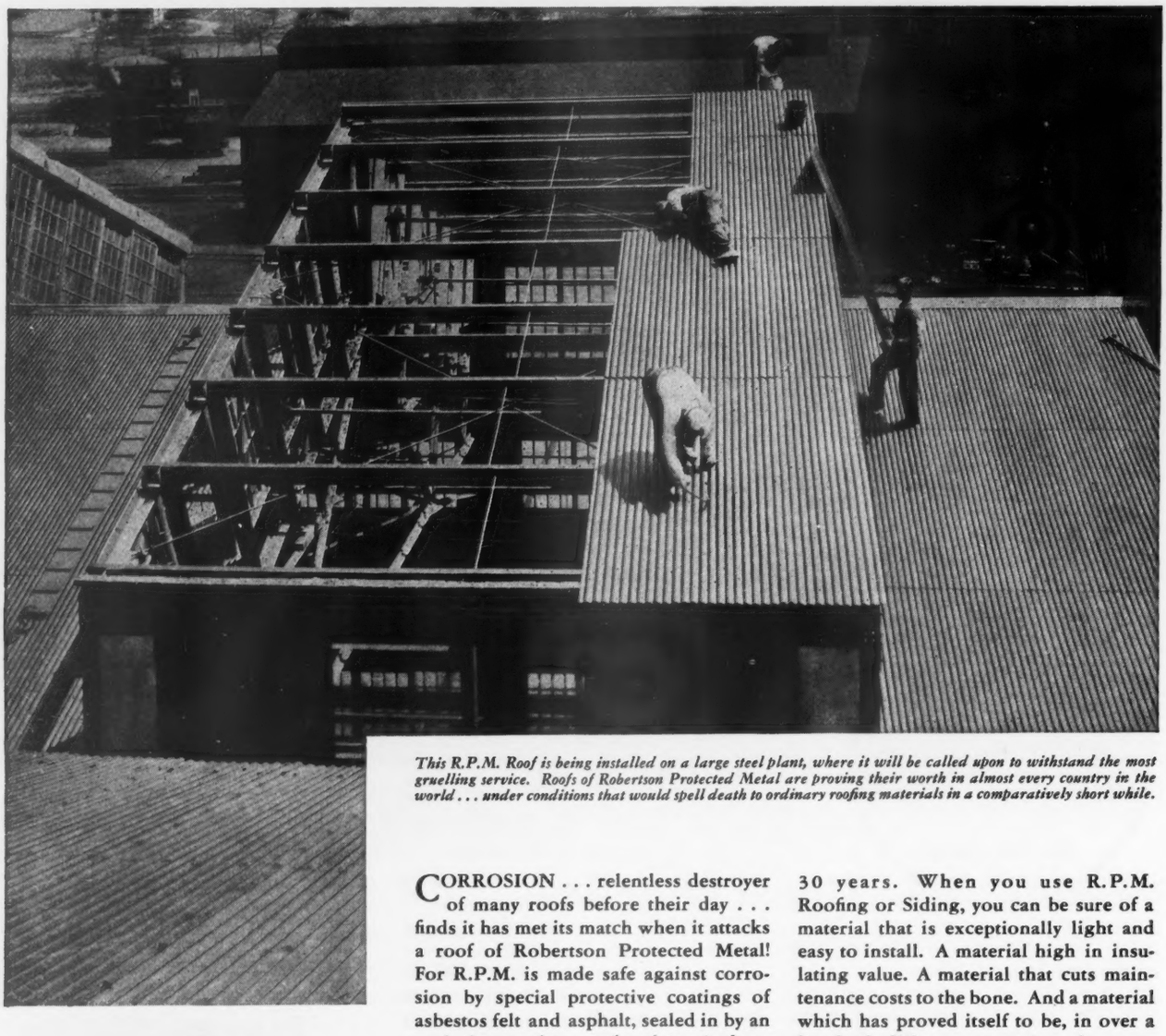
*Name*_____

*Address*_____

*City*_____ *State*_____

Corrosion takes a licking...

WHEN YOUR ROOF IS R.P.M.!



This R.P.M. Roof is being installed on a large steel plant, where it will be called upon to withstand the most gruelling service. Roofs of Robertson Protected Metal are proving their worth in almost every country in the world . . . under conditions that would spell death to ordinary roofing materials in a comparatively short while.

CORROSION . . . relentless destroyer of many roofs before their day . . . finds it has met its match when it attacks a roof of Robertson Protected Metal! For R.P.M. is made safe against corrosion by special protective coatings of asbestos felt and asphalt, sealed in by an exclusive weatherproof surface. And not only corrosion meets defeat, but R.P.M. resists chemicals, salt air, wind erosion and fumes with equal success. It gives you the fire protection you ought to have. It turns "thumbs down" on most of a roof's natural enemies.

Robertson Protected Metal has been making friends—and keeping them—for 30 years. When you use R.P.M. Roofing or Siding, you can be sure of a material that is exceptionally light and easy to install. A material high in insulating value. A material that cuts maintenance costs to the bone. And a material which has proved itself to be, in over a hundred different countries, the most economical roofing per year of service you can buy.

Examine the cut-away section of R.P.M. shown on this page. Then get the complete facts for yourself. We invite you to write for our free brochure "Roofs Over Industry." Address H. H. Robertson Co., 2011 Grant Bldg., Pittsburgh, Pa.

ROBERTSON *Protected* METAL ROOFING

Midget Metal-clad Switchgear

They SAVE even BEFORE they're installed

THAT'S the way with metal-clad units. Because you immediately eliminate the expense and delay of piecemeal buying. You may also avoid the need for extra construction—metal-clad is compact and saves space.

Your installation costs are kept to the minimum because you receive your metal-clad units completely assembled. You need only set them in place and connect the cables.

From that time on, through years of efficient, low-cost operation, you continue to receive the benefits of metal-clad. No guesswork about the adequacy of circuit protection—the G-E oil-blast breaker is conservatively rated, its action fast and positive in emergencies. No doubts about safety—G-E metal-clad is enclosed in grounded steel compartments. Proper operation is assured by a system of interlocks. Maintenance savings continue because silver main contacts in the breaker and silver disconnecting devices prevent heating.

G-E midget metal-clad—Type MI-9—ratings: 600, 800, and 1200 amperes, 2500 and 5000 volts, 25,000 and 50,000 kva

Larger metal-clad equipments—Type MI-6—are rated up to 2000 amperes, 15,000 volts, 75,000, 150,000, 250,000, and 500,000 kva

Ask your G-E representative for complete information. General Electric Company, Schenectady, N. Y.

880-28

GENERAL ELECTRIC

All beams concentrated downward on work plane.

All beams thrown upward in a powerful punch of light.

Combination concentrator and diffuser with medium or mogul swivel base.

95% downward punch 5% upward diffusion

95% upward light thrust 5% downward diffusion

Commercial color correction with minimum light absorption.

Making Lighting History with

BIRDSEYE

Reflector Lamps

Inside Silvered • Self-Reflecting

Vastly higher levels of illumination coupled with lowered operating costs are produced by this advanced type of incandescent lamp. Within two years' time these lamps have won the preference of front-rank engineers in the country's leading plants. (Names on request.)

WHAT THEY ARE: Specially designed, inside silvered, self-contained reflector lamps with filament in optically correct position.

WHAT THEY DO: Concentrate every ray on the work area undiminished by absorption due to soiled reflectors. Current conservation combined with absence of reflector maintenance insures substantial operating economies.

WHAT THEY COST: Always known as, "most expensive to buy—cheapest to own," Birdseye Lamps have just been repriced *downward* to truly competitive levels.

PROOF: Proof can be established right on your own premises. Write for full details and for technical data.

100 East 42nd St. BIRDSEYE ELECTRIC CO. **New York, N. Y.**

Reg. U. S. Pat. Off.

Factory: Gloucester, Mass.

HEAT YOUR PLANT NEXT WINTER AT A NEW LOW COST

Cut Your Fuel Cost as Much as 75%

The Smith Automatic Air Heater does just that. It uses coal, oil or gas. You have no boiler room . . . no foundations . . . no steam or water lines . . . no feed water heater pumps. You escape costly upkeep . . . This unit is the proven result of 15 years' industrial heating experience. *It does what we say.*

GET THE DETAILS NOW

JAMES CAMPBELL SMITH, INC.

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RENOLD

stock roller chain drives and accessories

BOSTON GEAR WORKS, INC.

RENOLD DIVISION

NORTH QUINCY, MASS., U. S. A.

"YOU COVER A WIDER RANGE AND WELD 15% TO 20% FASTER WITH THE NEW 'SHIELD-ARC SAE'—

"Set for welding thin sheets, this new Lincoln gives Slim the skill and fine touch of a modiste. And set wide open, the 'SAE' is a power house on wheels. With it, I can pour out the molten metal like a steel furnace.

"They tell me that the wider range and greater speed of this new welder are made possible by a combination of plus features. Make a note of these:

★ **"A SELF-PROTECTING MOTOR** enables you to use larger electrodes and weld at heavier loads continuously without danger of burnout.

★ **"INDEPENDENT EXCITATION** steadies the arc at all times. It's especially valuable at the low current values such as Slim needs.

★ **"DUAL *CONTINUOUS* CONTROL** gives you a wider selection of both voltage and current values and 'top' performances at every setting.

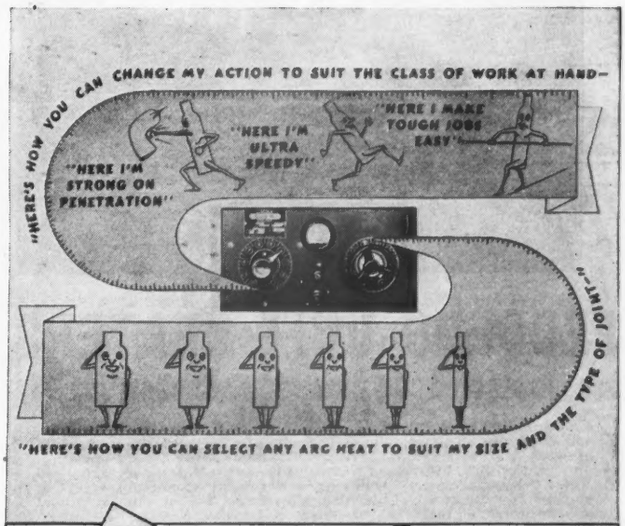
"In effect, you get two or three welders of different sizes when you buy one of the 'Shield-Arc SAE' machines. Yours for lower welding costs,

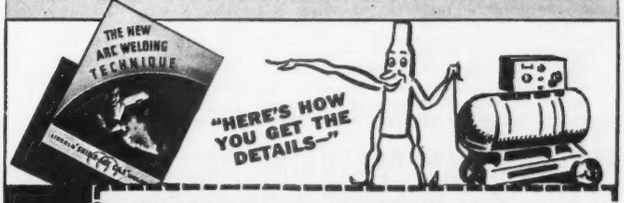
"FLEETWELD ROD"

—Spokesman for all progress-minded welding electrodes and emissary of

THE LINCOLN ELECTRIC COMPANY

Largest Manufacturers of Arc Welding Equipment in the World.


"HERE'S HOW YOU CAN CHANGE MY ACTION TO SUIT THE CLASS OF WORK AT HAND—
"HERE I'M STRONG ON PENETRATION"
"HERE I'M ULTRA SPEEDY"
"HERE I MAKE TOUGH JOBS EASY"
"HERE'S HOW YOU CAN SELECT ANY ARC HEAT TO SUIT MY SIZE AND THE TYPE OF JOINT—"



LINCOLN "SHIELD-ARC SAE"

THE WELDER WITH DUAL *CONTINUOUS* CONTROL

THE LINCOLN ELECTRIC COMPANY
Dept. R-424 Cleveland, Ohio

My welding application is_____
How can the "SAE" do it faster?

Send a free copy of Bul. 412 giving details about the new "Shield-Arc SAE" welder.

Name_____ Position_____

Company_____

Address_____

City_____ State_____

RAILROAD TRACKS
are Protected with
EXPANSION JOINTS

Pats. 1,970,105; 2,025,426. Other Pats. Pending

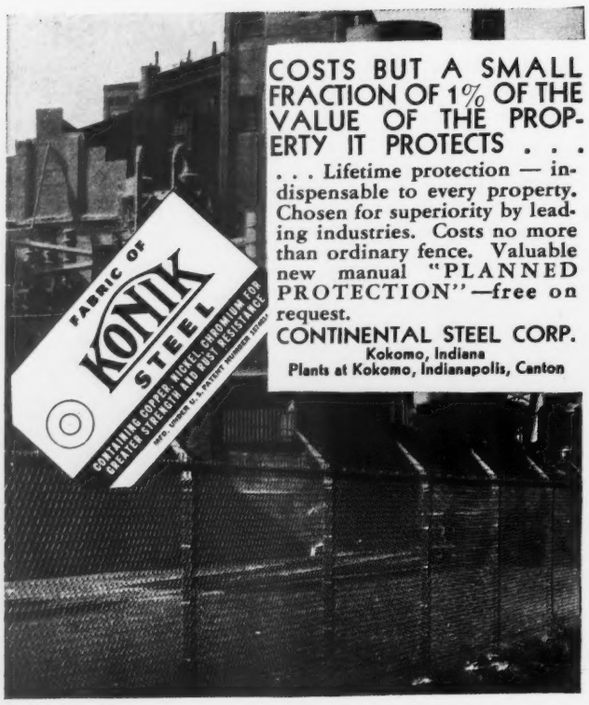
FEDDERS UNIT HEATERS
are Protected Against Self Destruction by

...Exclusive Full-Floating mountings which permit free movement of the heating element vertically in cabinet, and also protect it from torsional stresses. Tubes having 3 to 1 streamline ratio and individual convoluted fins allow each tube to "give" laterally, thus relieving differential expansion stresses within the element. This also allows the use of curved, non-diaphragmatic headers, assuring a stable heating element. Fedders convoluted fins are saddled over sides of tubes, to eliminate heat expansion stresses between fin and tube, thus maintaining a permanent thermal bond. Accordion design of fins eliminates stresses between bonding points.

Quieter operation and handsome, sturdy mono-piece cabinets make Fedders Unit Heaters ideal for commercial as well as industrial applications. Write for Bulletin 572.

FEDDERS MANUFACTURING CO., BUFFALO, N. Y.
Air Conditioning Units—Blast Heating and Cooling Surfaces

CONTINENTAL
Chain Link FENCE



COSTS BUT A SMALL FRACTION OF 1% OF THE VALUE OF THE PROPERTY IT PROTECTS . . .

. . . Lifetime protection — indispensable to every property. Chosen for superiority by leading industries. Costs no more than ordinary fence. Valuable new manual "PLANNED PROTECTION"—free on request.

CONTINENTAL STEEL CORP.
Kokomo, Indiana
Plants at Kokomo, Indianapolis, Canton

SPRING WASHERS

Spring washers and lock washers of every type and size, including the well-known Hipower and Kantlink types. There are thousands of more places where spring washers would improve the value of any product where bolts, nuts, cap or machine screws are used.

STEEL ROD ENDS

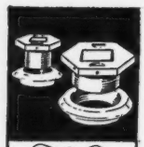
Drop forgings including steel rod ends of the adjustable yoke, plain yoke, and eye types. These articles in standard sizes and threads afford tremendous savings over special designs.

RETAINING RINGS

Spring retaining rings of special heat-treated spring steel are carried in many stock sizes—both open and closed types. Use of a spring retaining ring is an excellent manner of creating a shoulder on a shaft.

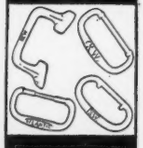
STEEL BARREL CLOSURES

Forged and machined fittings for steel barrels, drums, tanks and metal packages, including plugs, rings and flanges. Very rugged for use in transportation of alcohol, turpentine, oils and other expensive liquids.



CONTAINER HANDLES

Forged steel handles for heavy containers—can be rigidly welded, riveted or attached by a strap to lie flat when not in use. Rugged and most satisfactory for hard usage.



RHEOSTATS–RESISTORS–LOAD BOXES AND SPECIAL APPARATUS

Our electrical division—Hardwick, Hindle, Inc.—makes as fine electrical resistance products, fixed and variable, as can be devised.

Other products include windows for buses and railway cars, railway car window curtains, curtain rollers and fixtures, sash locks and lifts.

THE NATIONAL LOCK WASHER COMPANY
NEWARK N. J.—EXPORT DIV., 15 E. 26 ST., N. Y. C.

REPUBLIC RESEARCH

• • ADDS NEW LIFE AND POWER TO BELTING

BELTS live longest and work most efficiently under moderate tension. By constantly improving pulley gripping power and reducing belt tension, Republic Engineers have achieved in Challenger an amazingly efficient and long-lived belt.

Low tension reduces friction and bearing pressure with the result that more power is delivered to the machine. Production is increased. Maintenance costs are lower because of less stretch, fewer take-ups and greater ability to hold the fasteners.

Challenger Square Edge Belting is made in roll lengths or endless to specifications. For your next order, call the Republic Distributor near you and specify Challenger.

REPUBLIC RUBBER

Division LEE RUBBER AND TIRE CORPORATION
YOUNGSTOWN • OHIO

Manufacturers of HOSE
BELTING • PACKING
MOLDED PRODUCTS

ORDER REPUBLIC RUBBER PRODUCTS FROM YOUR DISTRIBUTOR

Boiler down—night call brings quick help from Scully. One of our officials received a call at his home at 10 o'clock one night. A boiler had broken down. We sent men to the warehouse, measured and cut the needed tubes and had them ready when called for at midnight.

"We must have it in the morning." Another emergency call came to us at 9 o'clock one night. Some Stainless Steel was needed for a rush job. We cut and delivered the order early the next morning.

IN EMERGENCIES TOO -call Scully

WHEN an emergency calls for steel or steel products in a hurry, prompt service will save you many dollars. When such an occasion arises, call Scully. We will meet that emergency.

And call Scully, too, for your regular requirements. We have huge stocks of steel, steel products, copper and brass in eight conveniently located warehouses. Try us.

Phone, write or wire the Scully warehouse nearest you. And send for our handy, complete Stock List and Reference Book. It's free, of course.

YOU'LL LIKE *Scully Service*

SCULLY STEEL PRODUCTS CO.

Warehouses at

CHICAGO • BOSTON • PITTSBURGH • NEWARK, N. J. • ST. LOUIS
BALTIMORE • ST. PAUL • CLEVELAND

UNITED STATES STEEL

Check your heating equipment NOW!

LET'S CHECK OUR HEATING EQUIPMENT, JACK. IT WILL SAVE US PLENTY OF TROUBLE LATER ON.
GOOD. IT WILL SAVE MONEY, TOO.
WORKS MANAGER

Money wasted in inefficient heating equipment, time lost because of cold delays and underproduction due to the inability to control temperatures in industry runs up into millions of dollars annually. To stop this waste check your heating system now! Buy American Blower Unit Heaters.

YOU CAN PUT A UNIT HEATER RIGHT UP THERE AND IT WILL BLOW HEAT OVER THIS WHOLE AREA.
GREAT! GET A HEATING CONTRACTOR IN AND LET ME KNOW THE COST.

Unit Heaters are the accepted, time-proved method of heating factories, garages, shops, stores, aviation hangars, service stations and other commercial establishments. They force heated air directly into working areas, heat up quickly and effectively, cut heating costs and prevent lost time.

I RECOMMEND AMERICAN BLOWER UNIT HEATERS. THEY COST NO MORE AND THEY'LL GIVE YOU BETTER SERVICE AND LAST LONGER.
THAT'S GOOD NEWS. THEY'RE A PART OF AMERICAN RADIATOR, THE WORLD'S GREATEST HEATING ORGANIZATION.

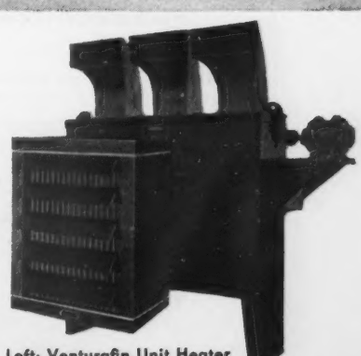
American Blower Unit Heaters are known as the world's finest units. They are scientifically designed and built by the world's largest manufacturers of heating equipment. Over 125,000 American Blower Units are already in use heating more than 350 million square feet of floor space.

American Blower Unit Heaters are sold with *certified capacity* ratings. *They cost no more than ordinary Unit Heaters* yet they insure better performance, lower operating costs and longer life. Ask any reliable heating contractor for American Blower Unit Heaters. They are carried in stock in all sections of the country. Sold on time payments (nothing down, 3 years to pay) by the leading heating contractors everywhere. Ask for them by name.

AMERICAN BLOWER CORPORATION

Division of American Radiator and Standard Sanitary Corp., 6000 Russell St., Detroit, Michigan • Canadian Sirocco Co., Ltd., Windsor, Ontario

AMERICAN BLOWER
INDUSTRIAL UNIT HEATERS



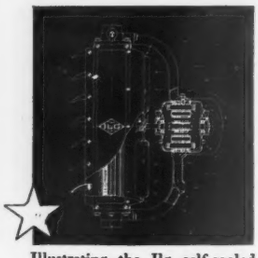
Left: Venturafin Unit Heater
Top: Sirocco Unit Heater

...Only
ILG UNIT HEATERS
are powered by the...
☆ ILG SELF-COOLED MOTOR

In the final analysis of unit heaters, the motor rates as the most vital part. Any comparison of quality or any measure of efficiency is definitely concerned with the motor.

A twenty-year performance record proves the dependability—the long life of the Ilg self-cooled motor, specifically designed for Ilg Unit Heater "hot spot" duty—highly efficient year after year. Every third Ilg Unit Heater sold represents a repeat order.

See and read about the latest models of Ilg Unit Heaters, built as a highly specialized product by the pioneers of the industry. Ask for new bulletin or—sign and mail the coupon for information regarding your specific heating problem.



Illustrating the Ilg self-cooled motor feature — positive flow of live air direct to heart of motor. Insures efficient operation at high temperatures.

ILG ELECTRIC VENTILATING CO.
2865 NORTH CRAWFORD AVENUE, CHICAGO, ILLINOIS

ILG

VENTILATION
and Air Conditioning

MEMO — Send me specific Ilg Unit Heater information as follows:

_____

_____

Name _____

Full Address _____

_____

Are YOUR water rates responsible for high water costs? If so... here's something to think about... and ACT upon:

1. Control your own water supply with a Deming Deep Well Turbine Pump. .. .. ..

2. A typical installation saved one company Two Thousand Dollars the first year. .. ..

3. Another company installed a Deming Turbine Pump and cut water costs 48%. .. ..

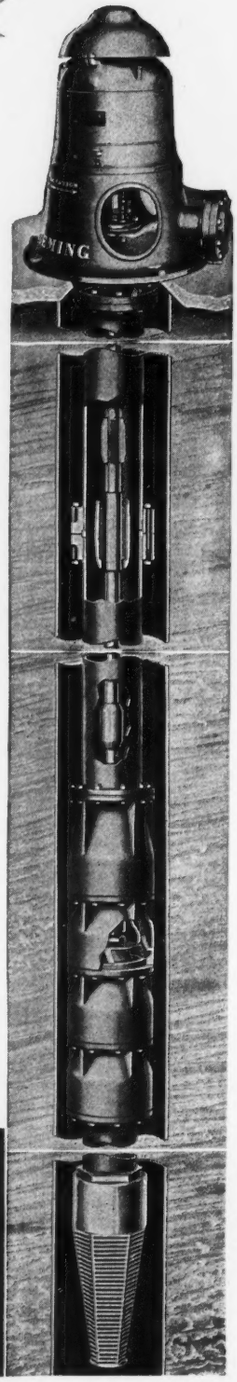
4. Another typical owner had paid a city water rate of 46¢ per 1000 gallons... A Deming Turbine reduced his costs to approximately 6¢ per 1000 gallons.

5. Deming Turbine Pumps are *water lubricated.* No oil to enter pump and contaminate water. All bearings continuously flooded and thoroughly lubricated. .. ..

6. *Adjustable impeller clearance* makes it possible to sustain original efficiencies over a long period of service. .. .. ..

7. Cutless rubber bearings, polished stainless steel bearing sleeves and many other features contribute to dependable performance and long life of Deming Deep Well Turbine Pumps. .. .. Write for Catalog. Check up on how YOU can cut water costs an easy, economical way.

THE DEMING CO. • SALEM, OHIO



DEMING PUMPS

ENCORE . . . *This advertisement, published in May issues of National Magazines, created so much favorable comment that it is now reproduced in this magazine by request.*

. . . *He is the Specialist* who responds at any hour to your emergency call. He knows, as no one else does, the arteries of life in your building . . . these vital lines of pipe which are sealed in concrete, walled in plaster, and buried underground and *which must not fail.* Your plumber's judgment is sound. He is your most reliable guide to a safe plumbing investment. Because he knows what pipe must do he recommends COP-R-LOY Pipe . . . for its economy to you; for the *better* service this famous Wheeling metal gives you through a *longer* period of years. Architects and engineers back up your plumber's recommendation of COP-R-LOY Pipe. They specify it, not alone for plumbing, heating and air conditioning, but for power lines, refrigeration, irrigation and other great industrial projects where COP-R-LOY durability meets the demand for unfailing performance.

WHEELING STEEL

YOUR PLUMBER IS YOUR FRIEND · HE RECOMMENDS COP-R-LOY PIPE ·

Copyright 1937, by Wheeling Steel Corporation, Wheeling, West Virginia

COP-R-LOY Reg. U.S. Pat. Off. **IT'S WHEELING STEEL**

Darnell E-Z Roll Wheels enable truckers to carry heavier loads with greater ease and give maximum protection to floors.

Eliminate the

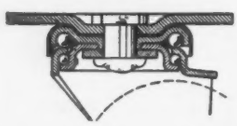
"Afternoon Energy Lag"

with DARNELL

Casters & Wheels

Production schedules are more easily maintained, efficiency is materially increased and accidents are largely eliminated when your workmen are freed from the "afternoon energy lag."

The unusual easy swiveling and rolling qualities of Darnell Double Ball-Bearing Casters and wheels effect many direct and noticeable economies that make their installation in your plant a matter of first importance.



A complete line of light, medium and Heavy Duty Industrial Casters.

NOTE DOUBLE BALL-BEARING DUST-PROOF SWIVEL —which not only provides easy swiveling under all conditions but increases the life of floors and equipment. The upper set of ball-bearings carries the load weight; the lower row takes up all lateral stress. Only Grade "A" balls are used, rolling in hardened and carbonized raceways.

Always SWIVEL and ROLL

Write us your caster problems. Darnell engineers will gladly confer with you in their solution. Write for Illustrated Literature.

THE NEW DARNELL CASTER AND WHEEL MANUAL NOW READY FOR DISTRIBUTION

DARNELL CORPORATION, LTD.

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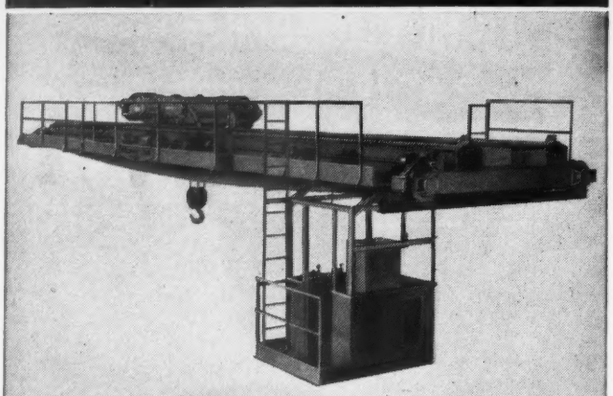
ELECTRIC TRAVELING CRANES

1 TO 450 TONS CAPACITY



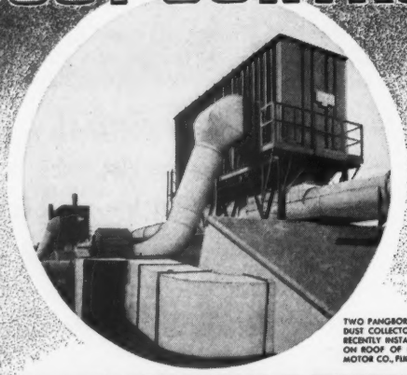
Every Detail of the Most Advanced Design

SHEPARD NILES CRANE & HOIST CORP.

364 SCHUYLER AVENUE, MONTOUR FALLS, N. Y.

A COMPLETE LINE OF CRANES AND HOISTS

DUST CONTROL



TWO PANGBORN DUST COLLECTORS RECENTLY INSTALLED ON ROOF OF BUICK MOTOR CO., FLINT, MICH.

PAYS DIVIDENDS THRICE!

1 **EFFICIENCY** Better and quicker work is accomplished when plant conditions are clean and free from dust. More work is produced per hour.

2 **PROTECTION** Dust control prevents explosion hazards, reduces wear and tear on equipment, and eliminates soiled stock losses.

3 **SALVAGE** Dust collection often turns out to be PAY DIRT in the form of salvaged valuable materials. Loss is eliminated by trapping dusts that have commercial value at their very source.

There are proper size Pangborn Dust Collectors for every requirement. We will gladly give you the benefit of our thirty years' experience if you will write us regarding your present conditions. Send for our free booklet, "Industrial Dust Control Through Exhaust Systems".

PANGBORN CORPORATION • • • HAGERSTOWN, MARYLAND

"World's Largest Manufacturers of Dust Control and Blast Cleaning Equipment"

PANGBORN

THE "Staff" THAT'S ON YOUR DESK

Open your Crane Catalog, and you open the world's greatest reference book on valves and fittings. There is nothing like it, anywhere else. The line it features is more complete, more comprehensive and more readily available throughout the country than any other.

The Crane Catalog contains far more than that. Within its pages is a technical "staff" constantly at your service. Examine the helpful engineering data which this encyclopedia of valves, fittings and piping contains. Here are the answers to many "new" problems that may arise in your plant. Here are the results of years of research—years of testing thousands of alloy and metal combinations that can be used in valves —82 years of valve and fitting manufacturing experience.

Your Crane No. 52 Catalog gives the answer, tested in the laboratory and proved on the job, to most of your valve problems. Look into it for the details regarding 38,000 items. Use it whenever you need valves, fittings, pipe or accessories. CranEquip for satisfaction.

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO, ILLINOIS

Branches and Sales Offices in One Hundred and Sixty Cities

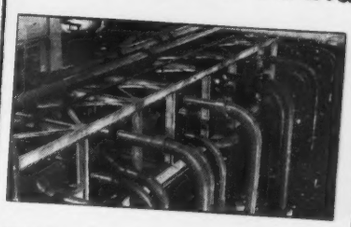
VALVES, FITTINGS, FABRICATED PIPE, PUMPS, PLUMBING AND HEATING MATERIAL

SEE OUR EXHIBITS AT: CONVENTION OF NATIONAL ASSOCIATION OF POWER ENGINEERS, ST. LOUIS, MO. AUGUST 30—SEPT 3. BOOTHS 89-90-91.

CHICAGO EXPOSITION OF POWER & MECHANICAL ENGINEERING. OCTOBER 4—9. NEW INTERNATIONAL AMPHITHEATRE—BOOTHS 1 and 2.

plied in the next few days.

BASIC PRINCIPLES OF POWER PIPING



CHICAGO, ILL., Aug. 18—The designing of piping requires highly specialized engineering knowledge. Crane engineers are always ready to give you the benefit of their long and wide experience in conveying steam, water, air, gas, oil, or anything similar from one place to another in your plant.

Basically there are six major principles to be observed in designing, although each opens the way to specialized study. These are:

1. Adequate strength and endurance in valves, fittings and piping. A high safety fact based on the physical characteristics of the materials should be provided.

2. Flexibility as insurance against building up dangerous expansion and contraction strains.

3. Proper and adequate support and anchorage to carry maximum load safely and to prevent vibration.

4. Properly selected pipe line joints for the service requirement.

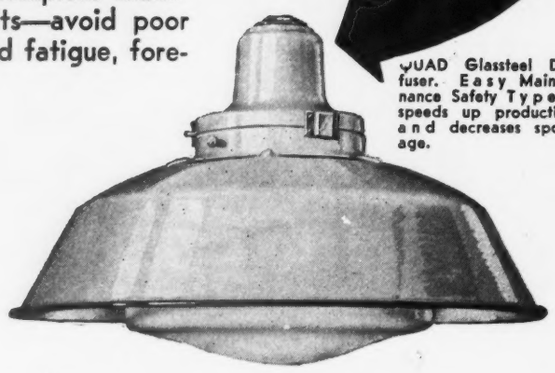
5. Complete control through valves of proper size, design, material and workmanship installed at essential points.

6. Proper and complete drainage of the line at all times.

You'll find a very large body of helpful piping data in your Crane No. 52 Catalog. Use it as a handy, trustworthy companion in planning piping. Use it also to order CranEquipment for your plant. CranEquipping is the reliable solution to piping problems.

ADEQUATE LIGHT ON THE JOB WITH QUAD REFLECTORS

Danger lurks in anything less than adequate foot candle intensities. Our Data-Book-Catalog gives you authoritative and complete illuminating data. Send for a copy today. Use Quad units—avoid poor lighting that cuts down output and produces strain and fatigue, forerunners of carelessness and ofttimes injury.



QUAD Glassteel Diffuser. Easy Maintenance Safety Type—speeds up production and decreases spoilage.

OTHER STANDARD QUAD UNITS

(Catalog of complete line on request)

QUAD RLM Reflectors are built to standard specifications tested and certified to give high light output.

QUAD Duplex Dome Reflector illuminates upper walls and ceilings with diffused light and delivers direct light downward.

Send today for the Quad Data-Book-Catalog chock full of illuminating data, pocket size, invaluable. Free copy on request.

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UNBROKEN working surface

» A CONTINUOUS, SMOOTH STEEL TOP MADE UP FROM STANDARD UNITS

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A Feature of

"HALLOWELL" STEEL WORK BENCHES

"Hallowell" Steel Work Benches are all made to a standard and are so accurately constructed and so designed that single units may be joined end to end to make one long unbroken working surface or the long benches broken up into standard sizes. This feature allows you to meet any change of production methods that may be encountered from time to time, something that cannot be done with wooden benches. Bolt holes in the steel feet make it easy to fasten to the floor and easy to move.

However used, the "Hallowell" is the market's biggest value. Our Bulletin gives details; get your free copy.

Fig. 847 "Hallowell" Steel Work Table.. Single unit of arc-welded steel

Pat'd and Pat's Pending

STANDARD PRESSED STEEL CO.

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BRANCHES: BOSTON, DETROIT, INDIANAPOLIS

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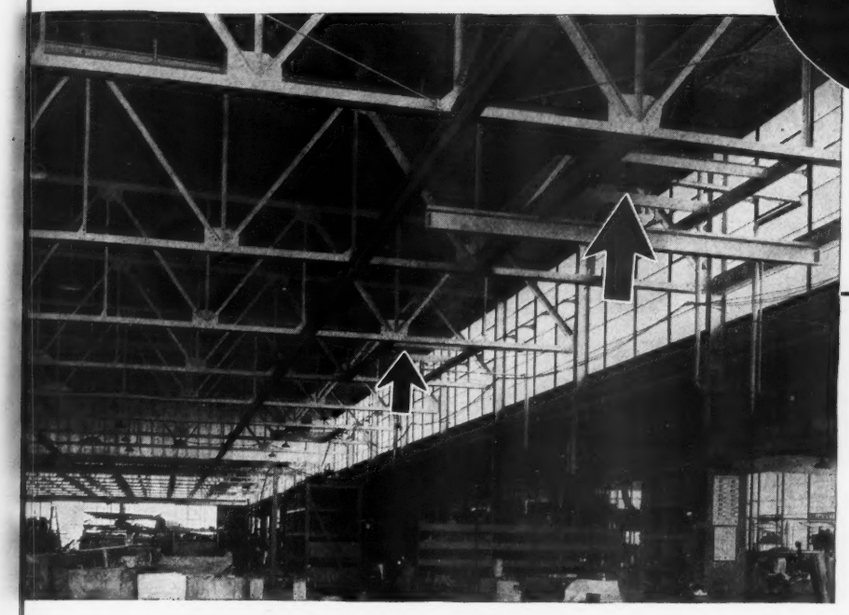
Grumman Air Craft Engineering Co., Bethpage, L. I.

HEATS MODERN PLANT and HANGAR

with...

Carrier Unit Heating

1. BIG PLANT? Right! It's 400 feet long, 150 feet wide—and the ceiling height is indicated in the illustration. But heating is a simple problem. Because of their remarkable efficiency, only 6 Carrier Heat Diffusers—served by *one* steam line—are required to heat the entire area.



Engineers Consider Installation Excellent Example of Modern Industrial Heating

2. CLOSE UP! (left, below). This is the type of Carrier Heat Diffuser used in the Grumman plant. Notice particularly the simple installation, and manner in which the outlets are designed to direct heated air *downwards*, into the working zone. That means economy—reduced heat rise.

3. IN THE HANGAR, (right, below), additional Carrier Heat Diffusers are used. And here again, although the area is approximately 300,000 cu. ft., only 2 units are required to keep the temperature at the proper degree. Compare that efficiency with old-fashioned heating!

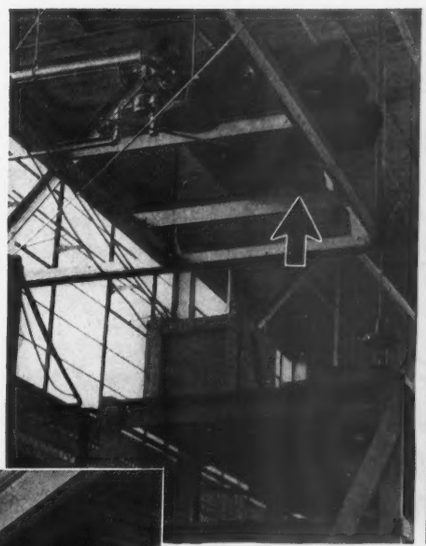
For New Plants or OLD— Carrier Unit Heating

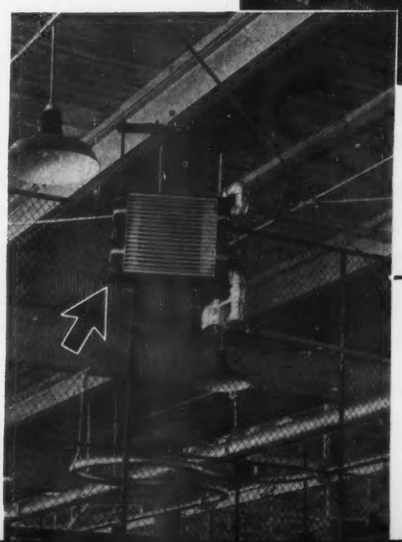
JUST because your buildings are *old* is no reason why you should continue to pay high fuel bills, and have cold, uncomfortable working conditions. Carrier Unit Heating is just as adaptable to *old* buildings as it is to *new* buildings.

Either Carrier Heat Diffusers or Carrier Unit Heaters —Kroy type—can be installed without extensive alterations. Frequently, because of their high efficiency, it is unnecessary to replace boilers and steam lines which have become inadequate for direct radiation. And, Carrier Unit Heaters can easily be removed, located in new plants, or new positions.

Once you install Carrier Unit Heating, your heating problem is ended for years to come . . . for Carrier Unit Heaters are built to endure. The coils, guaranteed to withstand working pressures of 200 lbs. per square inch, are non-ferrous — and constructed with the famous Carrier return bend principle which eliminates strains due to expansion and contraction, makes leakage virtually impossible. New, specially-designed fans cut power requirements as much as 50%—and are so carefully balanced that noise and vibration are negligible.

Get all the facts about Carrier Unit Heating, today. It may cut your fuel bill 25% or more.





4. OTHER SPACES, such as inspection rooms and testing rooms, are heated with Carrier Unit Heaters, Kroy type. Employing the same principles as the large Carrier Heat Diffusers, these units provide the same heating efficiency for smaller areas. Note attractive appearance—black finish and contrasting trim.

CARRIER CORPORATION, Desk 808, Syracuse, N. Y.

Send me complete information on Carrier Unit Heating for industrial plants, without obligation.

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NITROSE
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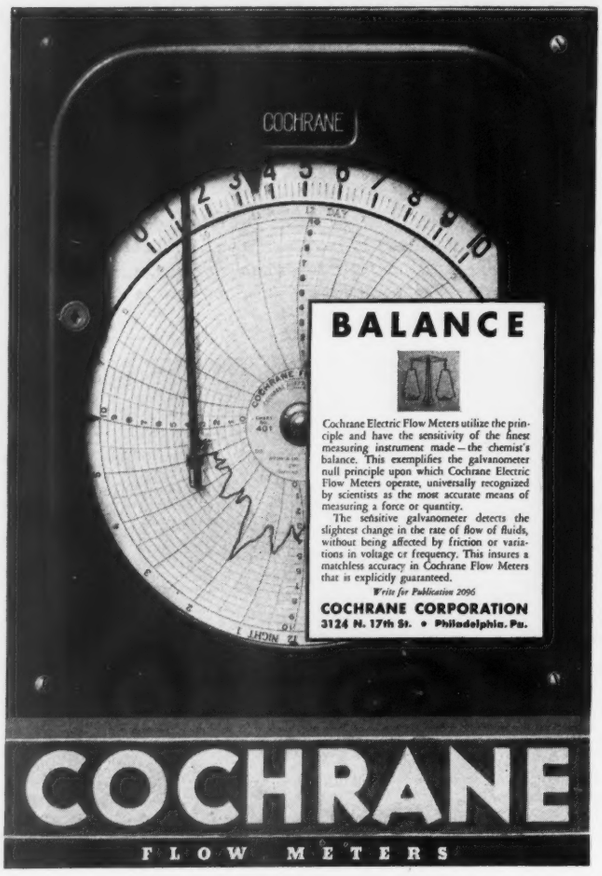
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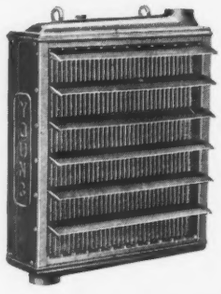

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MODERNIZE YOUR HEATING PLANT WITH Young UNIT HEATERS

Either the suspension or floor models will provide a most satisfactory and economical method of heating all types of industrial buildings. Young Blast Units and Commercial Units are designed to operate in conjunction with central fan systems for either heating, cooling, or air conditioning. All Young heating and cooling units are available in many sizes and capacities to fill the most exacting specifications.

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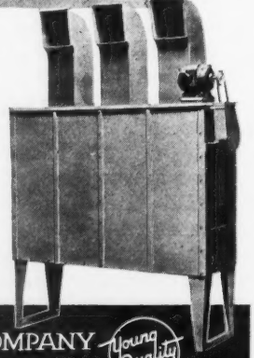

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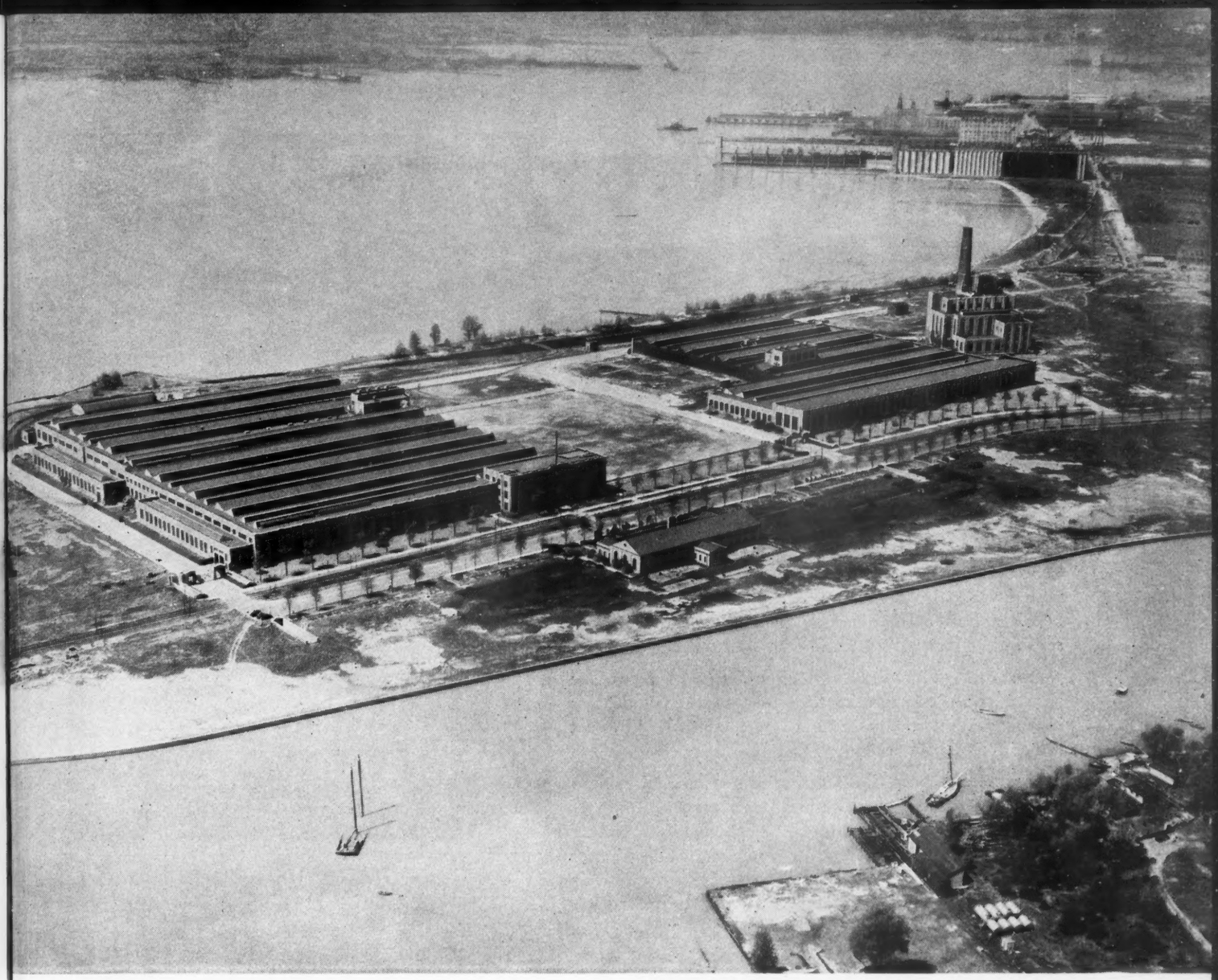
Young Quality



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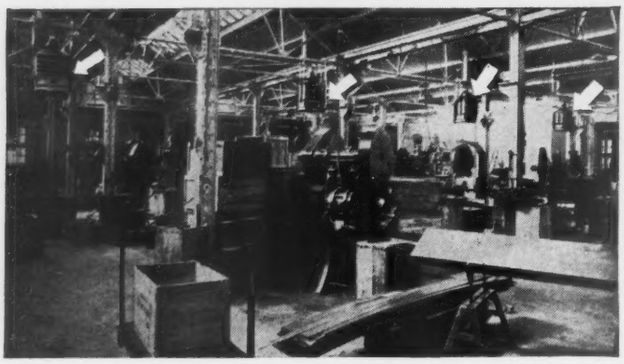
"...VERY EFFICIENT AND ECONOMICAL TO OPERATE..."



● So speaks an important middle-western manufacturer who decided he could save money by tearing out the 200 h.p. boilers in his newly purchased plant and installing 32 Janitrol gas-fired Unit Heaters.

"Another big advantage," he says, "is that we are able to spot heat, running one or a number of heaters in any one department without being compelled to heat the entire plant."

Suspended from the ceiling, these heaters take up no floor space...help keep floors dry...prevent freezing of water pipes...supply comfortable circulated warm air that promotes plant efficiency. Fourteen models—60,000 to 400,000 b.t.u. input—offer a range of choice for each requirement. See your Gas Company or any Janitrol dealer.

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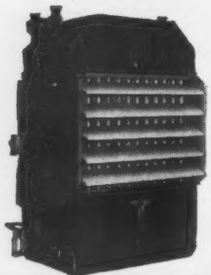

Janitrol

GAS-FIRED UNIT HEATERS

SEND FOR THIS INTERESTING BOOKLET

Yes... please send me the booklet "Concerning Heat for Your Place of Business."

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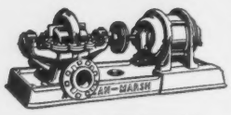
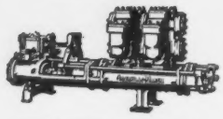


CENTRIFUGAL PUMPS .. Split and solid case types.



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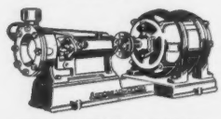

TURBINE PUMPS .. Only one wearing part, a perfectly balanced impeller.

Years ago our old name—American Steam Pump Company—was entirely appropriate, for then we made steam pumps only.

But now we also build centrifugal pumps, turbine pumps and power pumps for many services.

And so to better associate our Company name with our long established trade name — American-Marsh — by which most of our equipment is known, we have recently changed our Company name to that used in the signature below.

However, there has been no change in financial structure... no change in management... no change in quality standards maintained for more than 60 years... no change in address.

May we be favored with your next pumping inquiry?

AMERICAN-MARSH PUMPS, INC.

Centrifugal, Turbine, Steam, and Power Pumps

BATTLE CREEK . . . . MICHIGAN

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use Veeder-Root **MAGNETIC COUNTERS**

If units are of a substance, size or weight that makes them difficult or impossible to keep track of with mechanical counters... then turn the job over to Veeder-Root Magnetic Counters.

These remote-indicating instruments are connected with contacts that make and break the operating circuit. Counters can be centrally grouped in the office, any distance from the machine or process they report on.

Veeder-Root Magnetic Counters have an unlimited range of use. They're easy to install and connect... operate on dry cells, storage battery or generated current. Write for installation recommendations and prices.

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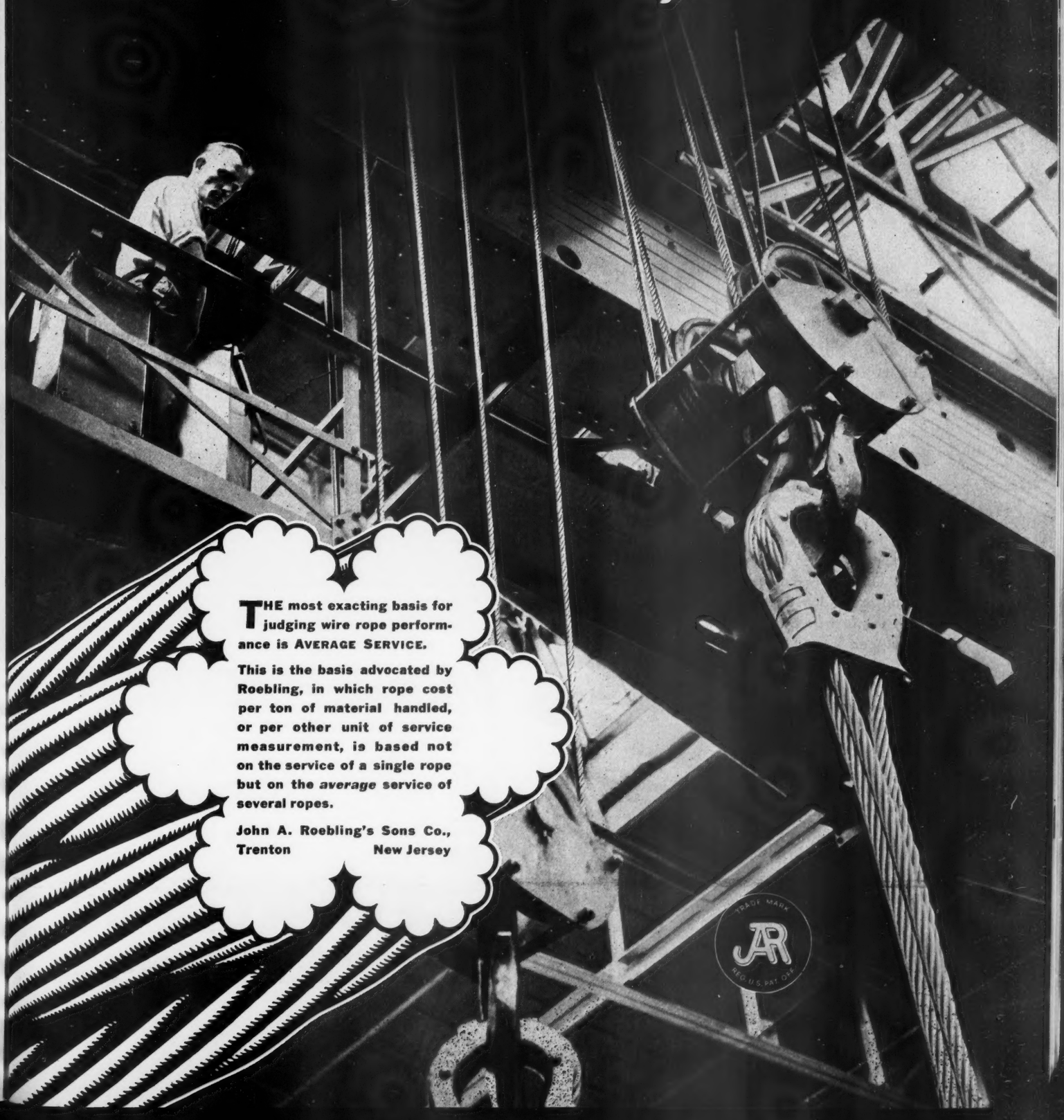
Roebling...

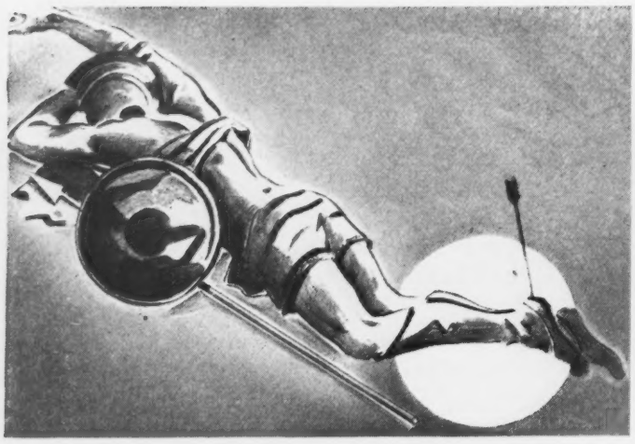
The pacemaker in wire rope development



THE most exacting basis for judging wire rope performance is AVERAGE SERVICE.

This is the basis advocated by Roebling, in which rope cost per ton of material handled, or per other unit of service measurement, is based not on the service of a single rope but on the *average* service of several ropes.

John A. Roebling's Sons Co.,
Trenton New Jersey



ACHILLES.. had a HEEL

ACHILLES, one of the heroes of the Trojan War, thought he was invulnerable because shortly after his birth his mother had dipped him in the River Styx. But he had one weak spot—his heel, by which his mother had held him and which was therefore not covered by the magic waters. And it was an enemy arrow in that one unprotected spot that finally laid him low.

Many a control system, upon which production and even the safety of workers depends, will be found to have a similar "weak spot" in the open-contact or fragile glass switches which make and break the circuits. These "weak spots" can be protected by DURAKOOL mercury switches, made of metal which cannot break, and filled with liquid which can neither burn nor explode. DURAKOOL* switches are operating today under 600-volt, highly inductive loads.

DURAKOOL does not manufacture control instruments. But the instruments of any manufacturer can be equipped with DURAKOOLS. Often it costs less to equip with DURAKOOLS, which handle loads direct where other types of contacts require the use of expensive relays. Full information will be sent for the asking. DURAKOOL, INC., 1069 North Main Street, Elkhart, Indiana.

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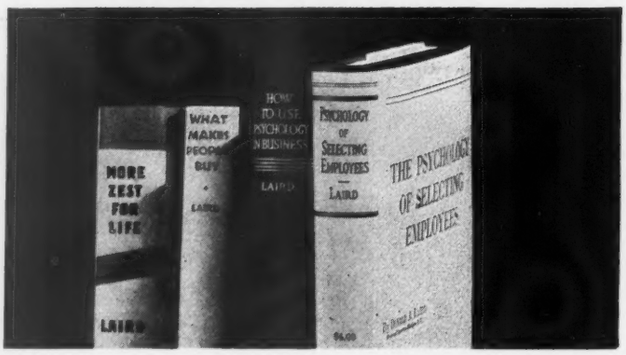

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Successful methods, standards, specifications and tests for selecting the right employees for the right places are described in detail in this book, in as non-technical a manner as possible, with a generous use of actual examples, explanatory charts, tables, diagrams. A sound, sensible explanation of the use of modern psychology in employee selection.

THE PSYCHOLOGY OF SELECTING EMPLOYEES

By DONALD A. LAIRD

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Look up:

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—rules to follow in testing
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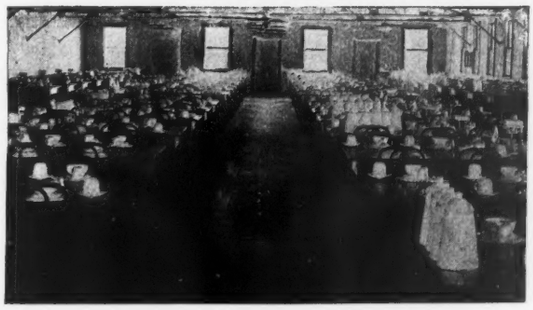
"so they MASTIPAVED the floor"



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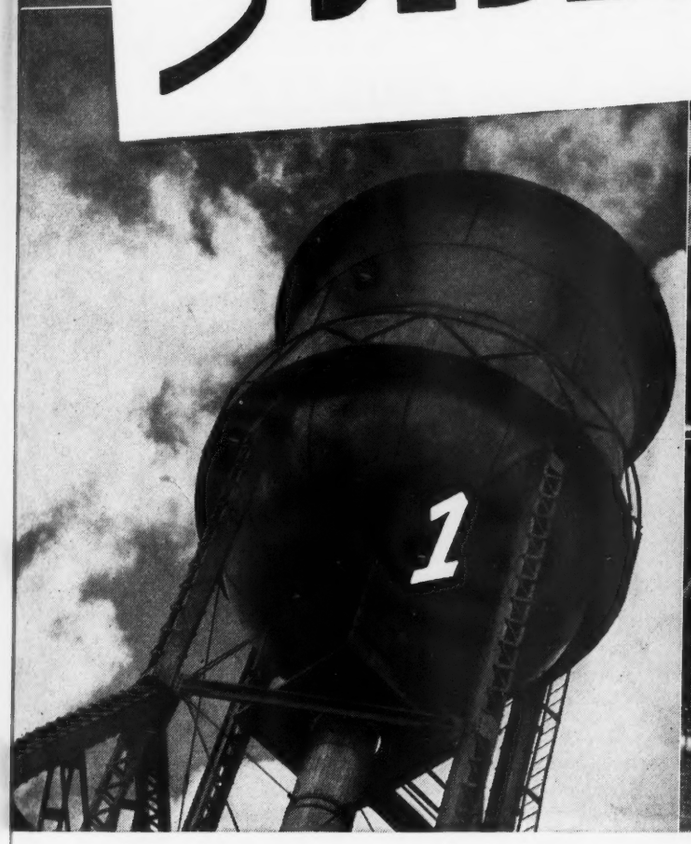

1 DEREKA:—On water towers, steel sash, fire escapes and fences . . . in fact, wherever metal is exposed to the elements, fumes or gases.

2 DEB-E-LITE:—For walls and ceilings that you can keep clean and white, for better working conditions that increase plant efficiency.

3 DECOSEAL ALUMINUM:—For walls, partitions and ceilings, for pipe lines and pipe coverings. Wherever you want a metallic aluminum finish.

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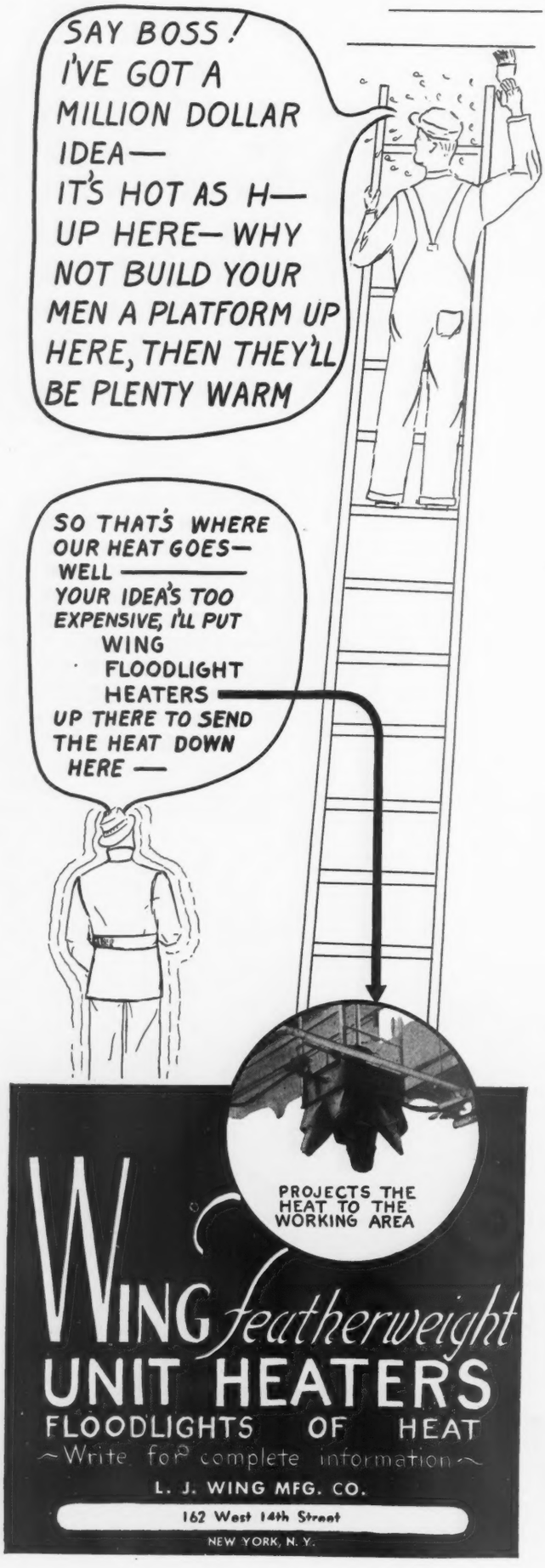
SAY BOSS! I'VE GOT A MILLION DOLLAR IDEA— IT'S HOT AS H— UP HERE— WHY NOT BUILD YOUR MEN A PLATFORM UP HERE, THEN THEY'LL BE PLENTY WARM
SO THAT'S WHERE OUR HEAT GOES— WELL — YOUR IDEA'S TOO EXPENSIVE, I'LL PUT WING FLOODLIGHT HEATERS UP THERE TO SEND THE HEAT DOWN HERE —
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His bent-over position is a sign of that old trouble—thermometer-itis."*

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Let Taylor BINOC Tubing in new Taylor Industrial Thermometers help to eliminate inaccurate readings in your plant.

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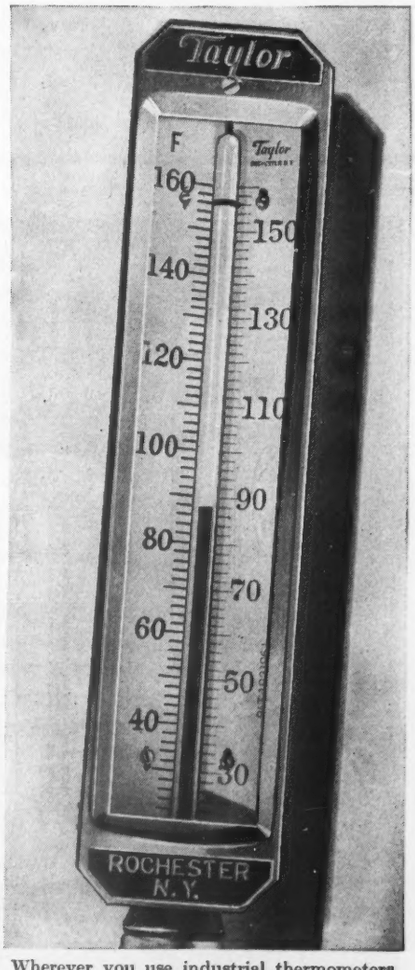
Today you can say "Good-bye" to the old single-lens type that causes squinting, careful focusing on the mercury column and close-up readings. With BINOC Tubing, Taylor Engineers have made industrial thermometers so much easier to read that previous types seem old-fashioned.

The triple-lens construction of Taylor BINOC Tubing, with the much wider background for reflecting light on the mercury and the broader mercury column, increases readability and visibility from two to five times. It more than doubles the angle of vision in which thermometer readings can be made. It eliminates the bore reflections that used to trick even the most experienced employees. In Taylor Industrial Thermometers with BINOC Tubing the top of the mercury column is silhouetted clearly and cleanly for easier, more accurate readings.

Engineers have called the development of BINOC Tubing one of the most important advances ever made in mercury-and-glass thermometry. Prove to yourself that it makes possible easier, quicker and more accurate readings at greater distances from the thermometer than before. Ask a Taylor Representative to demonstrate this new tubing in Taylor Industrial Thermometers and estimate for yourself how it can act as a greater safeguard of product uniformity and quality. Taylor Instrument Companies, Rochester, N. Y. Plant also in Toronto, Canada.



Wherever you use industrial thermometers, this new Taylor Thermometer with BINOC Tubing will act as a more certain safeguard against incorrect or haphazard temperature readings.

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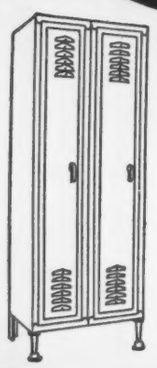

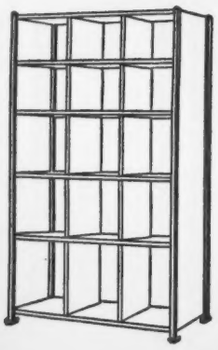

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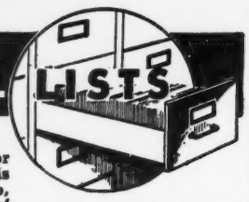

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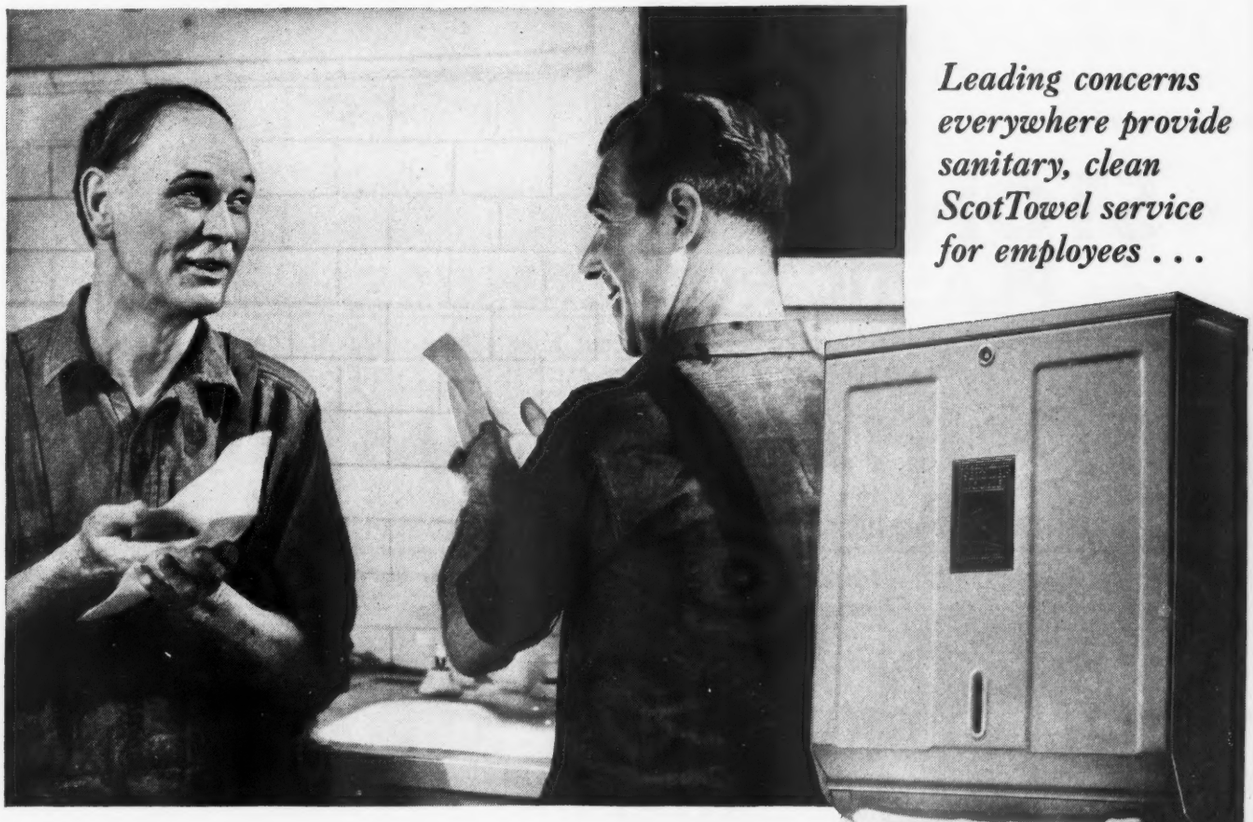

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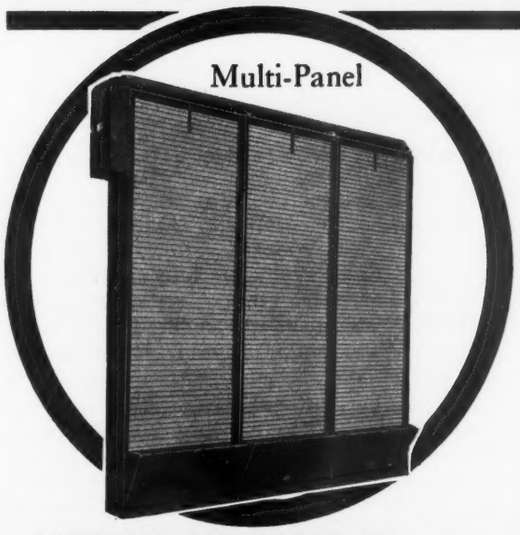

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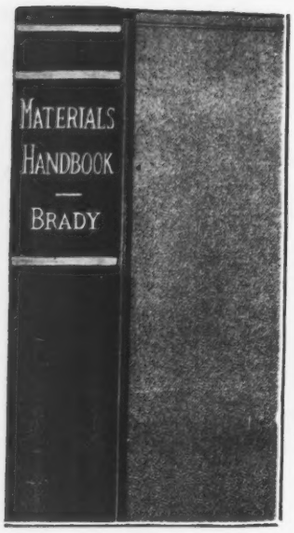

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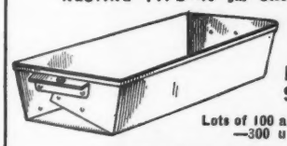

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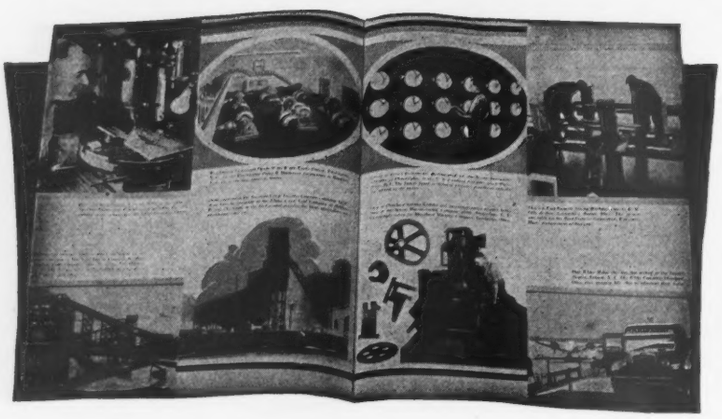

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1-500 hp Al. Ch. 450 rpm
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400	G.E. sl. rg.	505
400	West. sl. rg.	514
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300	G.E. syn.	600
300	Al. Ch. sl. rg.	585
250	West. sl. rg.	700
250	G.E. sl. rg.	257
225	El. Mchy. syn.	450
225	G.E. sl. rg.	1800

DIESEL ENGINE GENERATOR SETS
200 H.P. McIntosh & Seymour, 8 cy. V-type Diesel, 500 rpm, direct con. 135 KW. DC. G.E. gen. Note. Can furnish AC gen.

ROTARY CONVERTER
1—550 K.W. G.E. Type HCC, 600 v. D.C. 6 phase, 60 cycle, 1200 rpm.

CENTRIFUGAL PUMPS
2500 GPM. Delaval type 10, 159'-75 lb. 10", S. Stage, D. Suction.

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High grade man with mature experience in planning and scheduling, for job machine shop operating three shifts a day and employing 200 or more men. Compensation and opportunity commensurate with ability of applicant.

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Contact selected employers in any territories through our confidential and effective methods. Established 22 years. Write.

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Motors and Generators, A.C. and D.C. for sale at Attractive Prices. Large Stock. New and Rebuilt All Guaranteed. *Write for Stock List and Prices.*

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FORT WAYNE, IND.

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NO MORE "IMPOSSIBLE" DRILLING JOBS

With the Black & Decker ½-Inch Drill and the Right Angle Attachment

HERE'S the combination which will save hours of time, temper and "taking apart" on countless maintenance, construction and production jobs. The Right Angle Attachment makes it possible to drill in tight, awkward places ordinarily inaccessible with regular drills. Can be used with metal drills up to ½-inch, wood augers up to 1-inch, and hole saws up to 3½-inches. The attachment is adapted to the ½-inch Special, and ½-inch Heavy-Duty Drills, and is quickly removed for regular use of the Drill. Ask your jobber for a demonstration—or write for catalog. The Black & Decker Mfg. Co., 719 Pennsylvania Avenue, Towson, Md.

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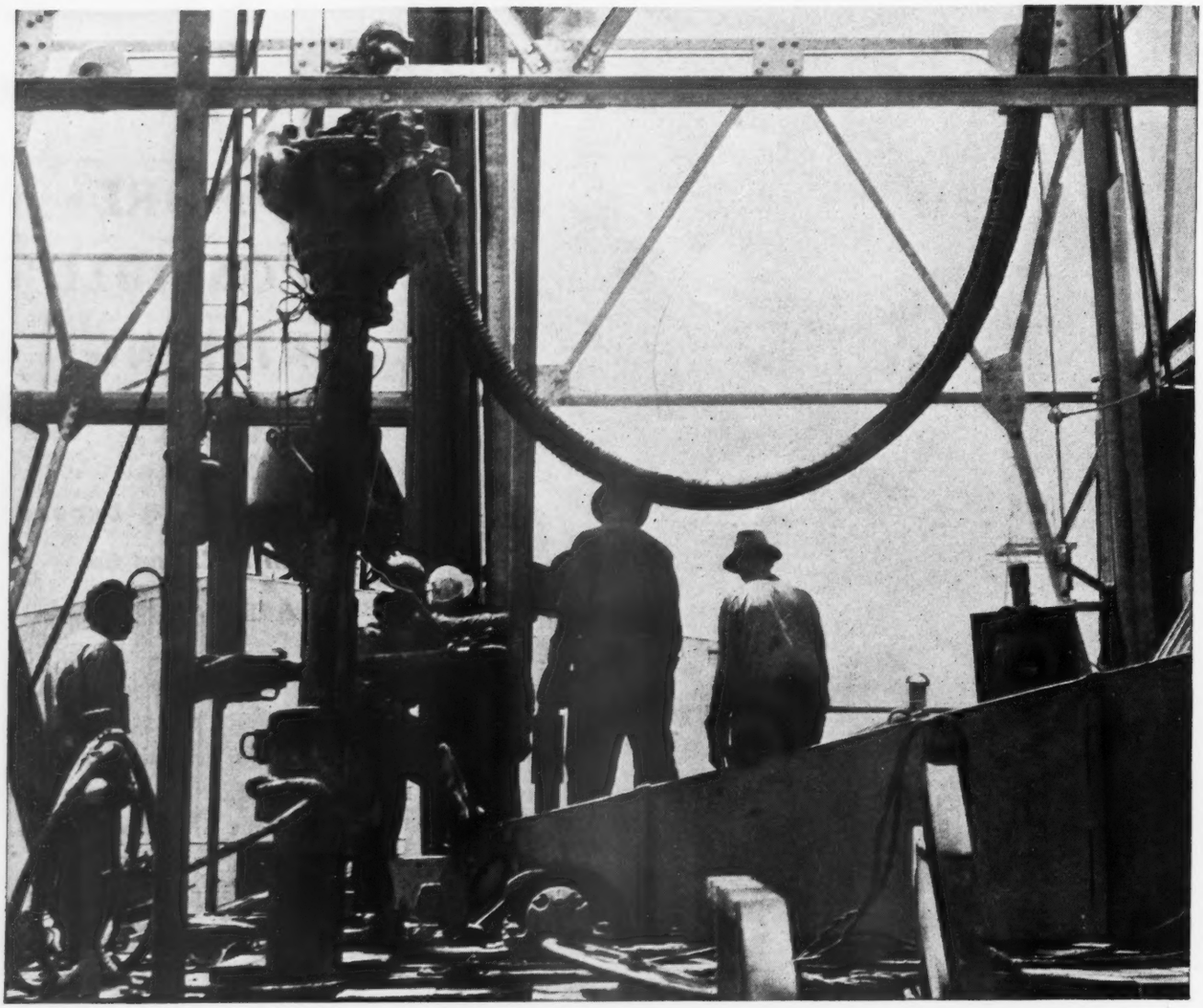
World's Largest Manufacturer of

PORTABLE ELECTRIC TOOLS



CAN THEY DRILL THROUGH TO 中國?

A typical example of Goodrich improvement in rubber

OIL WELL DRILLERS say that if wells get much deeper they'll find themselves "puncturing a hole through to China." 10,000 feet, 12,000 . . . new records are being reported constantly. Yet not many years ago 3,000 feet was the limit.

Rotary drilling was being perfected —literally boring a hole in the earth as though with a huge auger, and pumping mud under pressure in a steady stream into the hole, to lubricate the drilling and carry back to the surface the earth and rock from the drill. But, to sink holes deeper than 3,000 feet required more pressure behind the stream of lubricating mud than the 200 pounds then used, and there was no hose sufficiently flexible and at the same time strong enough to carry more pressure without danger of bursting and killing the drillers.

Goodrich engineers went to work on the problem. They developed a hose made of rubber, fabric and wire which will stand a test pressure of 6,000 pounds, and with this new hose deep wells became practical, cost of securing oil went down, new oil fields were opened.

Goodrich engineers could never have made such a spectacular improvement in hose if it were not for the fact that they are constantly working on improvement in all types of mechanical rubber goods. By this constant research new rubber compounds, new methods of manufacture are developed for even the most standard Goodrich products. The same skill which made high pressure drilling hose possible is applied to any problem you may have, to improve the value and reduce the cost of mechanical rubber goods in your operation. Your Goodrich Distributor can help you take advantage of these improvements. The B. F. Goodrich Company, Mechanical Rubber Goods Div., Akron, Ohio.

Goodrich

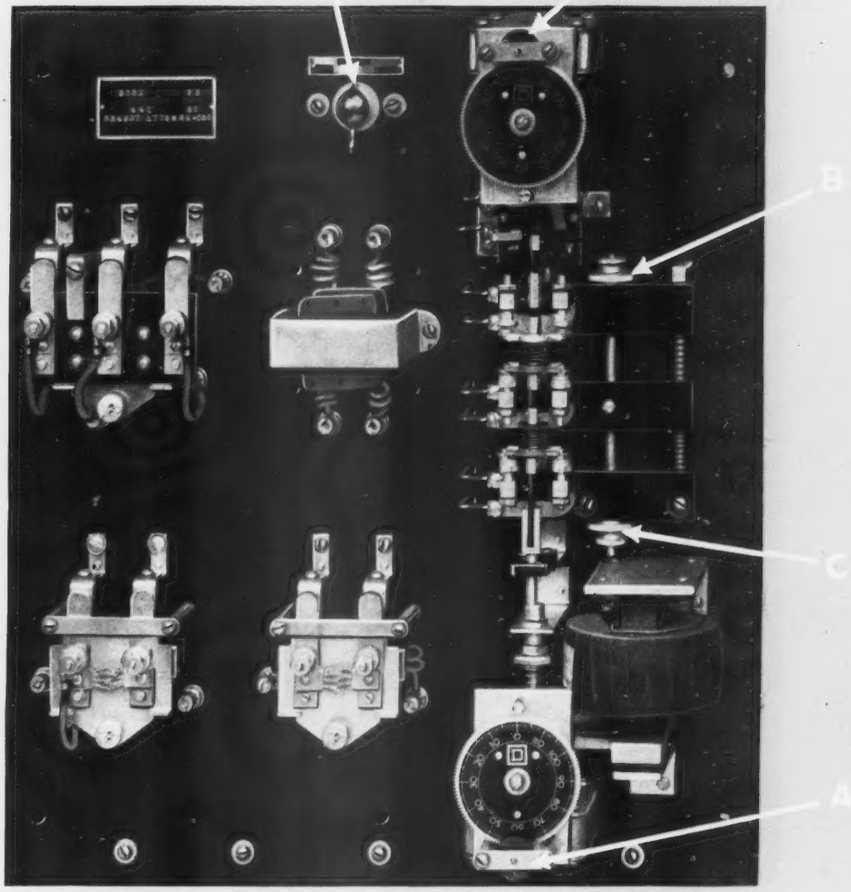
ALL *products problems* IN RUBBER

Another story of Goodrich development work appears on page 3

WITH THE *New* SQUARE D Automatic Control

a portable, air-operated gun welder *becomes a general purpose tool*

•



Class 9052, Type C-3 timer panel removed from enclosure

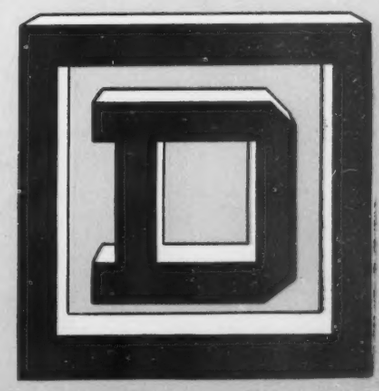
- **A. Adjustment for Delay, Weld and Hold periods**
- **B. Selective adjustment for Weld period**
- **C. Proportioning adjustment for Delay and Hold periods**
- **D. Adjustment for Off period**
- **E. Selector switch for repeat or non-repeat operation**

MANY operations in your factory can be done more economically by spot or stitch welding. They can be done with a single air-operated, portable gun welder if it is equipped with the new fully automatic Square D control.

There are four intervals in a welding cycle which must be individually timed in order to obtain high speed production and a better finished product: "Delay"—building up of pressure on the electrodes; "Weld"—flow of current through the work; "Hold"—maintaining pressure after the weld; "Off"—the period prior to repeating the cycle.

The new Square D automatic timer provides accurate adjustment for each period of the cycle and any air-operated welding machine, so equipped, becomes a high speed and very efficient tool for a wide range of welding operations.

Square D also builds high speed, heavy duty welding contactors, which are recommended for use with Square D timers.

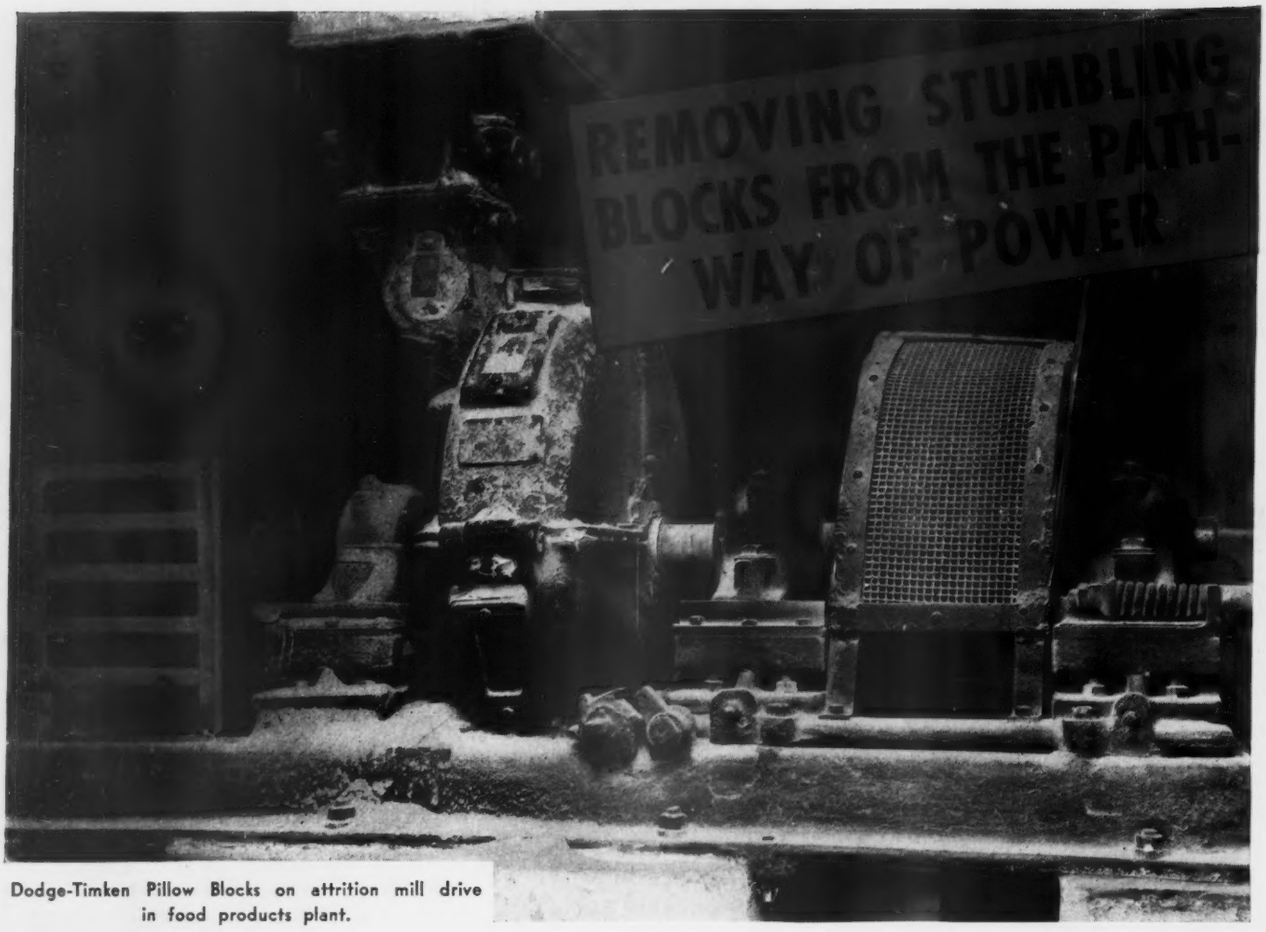


SQUARE D COMPANY

DETROIT - MILWAUKEE - LOS ANGELES

SQUARE D COMPANY CANADA LTD. TORONTO, ONTARIO

CALL IN A SQUARE D MAN



Dodge-Timken Pillow Blocks on attrition mill drive in food products plant.

A symbol of quality for any piece of equipment with which it is associated

8 Budd-built Zephyrs are now rolling on TIMKEN Bearings.

Glide—as you ride a Timken-equipped Train

Every obsolete line shaft hanger and pillow block in your plant is not only a hindrance to the smooth, efficient flow of power but also a source of serious power loss and high maintenance cost.

Modern power transmission units equipped with TIMKEN Tapered Roller Bearings are free from friction and its associated evils—wear and waste. They get the power to the job with the least possible loss, economize lubrication, preserve shafts and prevent production interruptions due to transmission failures.

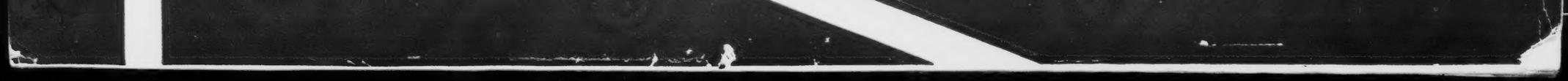
What is the use of installing new modern machinery if it is going to be dependent upon wasteful, worn-out transmission equipment for its power supply? Timken-equipped units will soon pay for themselves in power, lubricant and time savings. Why penalize profits by retaining equipment that continually operates at a loss?

THE TIMKEN ROLLER BEARING COMPANY, CANTON, OHIO

Manufacturers of Timken Tapered Roller Bearings for automobiles, motor trucks, railroad cars and locomotives and all kinds of industrial machinery; Timken Alloy Steels and Carbon and Alloy Seamless Tubing; Timken Rock Bits; and Timken Fuel Injection Equipment.

TIMKEN

TAPERED ROLLER BEARINGS



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Factory

OCTOBER
1937

Management and Maintenance

An Outline for Employee Education

Wage Incentives in 135 Plants

The "Why" of Our Power Drives

McGRAW-HILL PUBLISHING COMPANY, INC.

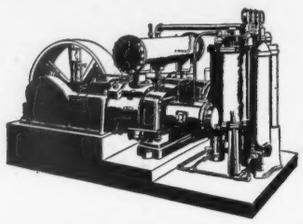
"The Standard Lubrication Engineer was here today...

we cut down the oil feed on the Corliss"

Such conversation takes place somewhere almost every day. Not always in the power plant nor about Corliss operation. It may concern turbines or Diesel engines, a paper machine or mine locomotive, but "the Standard Lubrication Engineer was there . . ." and suggested a saving.

That is only natural. Standard Lubrication Engineers are trained, equipped and placed at your service for the purpose of spotting opportunities to reduce lubrication costs in your plant. Their knowledge of lubricants enables them to make these savings *safely*—without sacrificing lubricating quality or obtaining low cost lubrication at the expense of high maintenance. Their combined experience covers every phase of industrial lubrication.

You have been overlooking a real opportunity to get helpful, money-saving suggestions on lubrication if you have failed to investigate this service. It's free. Call your local Standard Oil (Indiana) office today and ask for the Standard Lubrication Engineer.



SIMPLIFIED LUBRICATION with STANOILS—SEVEN GRADES

Stanoils afford an unusual opportunity to standardize and save on general plant lubrication.

They were definitely developed to provide *one* line of high grade oils that could be used for a multiplicity of lubrication requirements.

Although seven grades are provided, Stanoils can replace 27 other oils. Exceptionally high stability, low pour test and good viscosity index are some of the outstanding characteristics.

Stanoils can be used in both circulating and bath oiling systems, speed reducers, compressors and all types of oil lubricated bearings, even under conditions of extreme heat.

Let a Standard Oil representative show you where Stanoil can be used to reduce stocking, handling and oiling costs with increased lubricating quality in your plant.

©1937, Standard Oil Co.

THE RIGHT LUBRICANT • PROPERLY APPLIED • TO REDUCE COSTS

STANDARD OIL COMPANY (INDIANA)

LUBRICATION ENGINEERING

RUBBER PUTTY ENDS TUG-OF-WAR BETWEEN GLASS AND STEEL

A typical example of Goodrich development in rubber

GLASS and steel don't get along together. Heat and cold make them expand and contract at different rates, so that ordinary putty—which hardens—pulls away from one or both, and leaves a gap. This means expensive re-puttying, especially in greenhouses where the glass slopes toward the sun so that the putty deteriorates more quickly.

Then Goodrich engineers began to experiment for a flexible putty, and found it. This Goodrich putty, made of rubber, never loses its resilience. It expands and contracts with every change in the steel (or wood) and glass, and so keeps a permanently tight, air-proof seal, and assures greater protection because it eliminates drafts. Goodrich rubber putty is already in use on thousands of panes of glass. Some users say it will last two or three times as long as other putty, and correspondingly reduce the cost and work of troublesome maintenance.

That job of Goodrich research was important to every maker and user of windows, but *every* job of Goodrich research is important to you who use industrial rubber goods—because this research is constantly improving belting, hose, packing and every other Goodrich product, to keep them abreast of changing modern needs, and make them better values for you who use them. See your Goodrich distributor for better value in all rubber products you buy. Write us for his name if you don't know him. The B. F. Goodrich Company, Mechanical Rubber Goods Division, Akron, Ohio.

Goodrich

ALL *products problems* IN RUBBER

Another story of Goodrich development work appears on the page facing the third cover

Quick service on

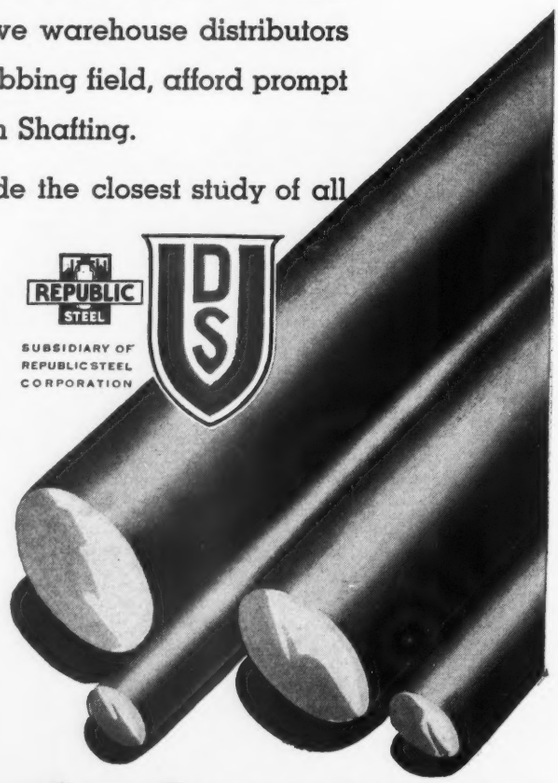
POWER TRANSMISSION SHAFTING

FROM A NEARBY

UNION DRAWN DISTRIBUTOR

● Independently owned warehouse stocks of Union Cold Finished Shafting, carried by more than one hundred and twenty-five warehouse distributors in the mill supply as well as the iron and steel jobbing field, afford prompt and capable service on Union Power Transmission Shafting.

For nearly fifty years, Union Drawn has made the closest study of all types of shafting requirements and has steadily improved the quality of this important material. Cold Drawn and Ground as well as Turned and Ground Shafting are manufactured in addition to the more common Cold Drawn or Turned and Polished grades. Any analysis of carbon, alloy or stainless steel can be supplied. For complete details, write for "Shafting Handbook."

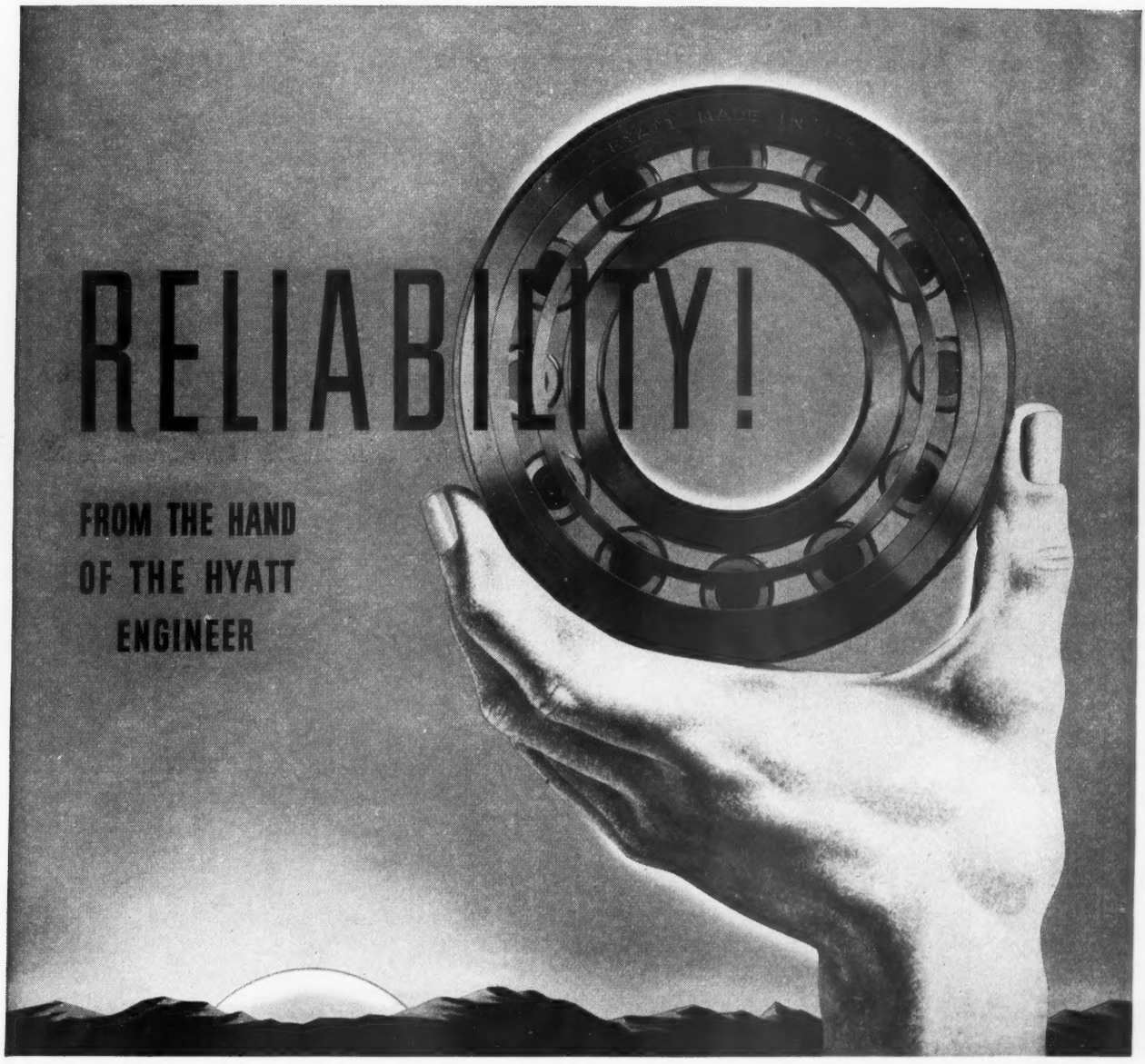


UNION DRAWN STEEL CO.

MASSILLON, OHIO

MEMBER OF POWER TRANSMISSION COUNCIL

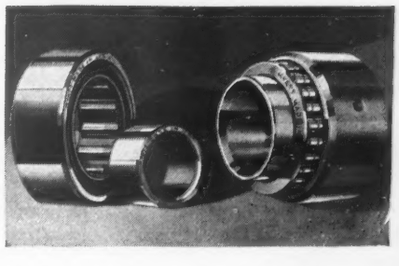
Union Cold Finished Shafting



RELIABILITY, in the machines you build or use, starts at the bearing points! Use Hyatt Roller Bearings with complete assurance that they will give you longer life under heavy loads, keep related parts in alignment, resist wear, minimize maintenance, and transmit the full measure of power. Not because of any secret formulae, but because of the advanced design by Hyatt engineers and precision manufacture of Hyatt craftsmen.

Evidence of Hyatt reliability is found everywhere in industry... wherever shafts, gears and wheels turn...in mill and factory, on the farm, on railways and highways. Certainly these bearings have a tough life, but, fortified by nearly fifty years' experience in building better bearings, Hyatts definitely have proved they can take it. Hyatt Bearings Division, General Motors Corporation, P. O. Box 476, Newark, New Jersey.

HYATT
ROLLER BEARINGS



Be Modern . . . Put Your OVERHEAD LIGHTING *On Wheels*

with BULL DOG

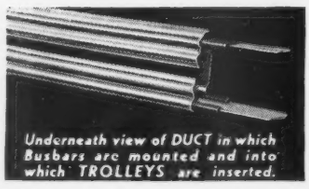
UNIVERSAL TYPE *Trol-E-Duct*

Lighting Fixture attached to a TROLLEY which acts as both feeder and movable means.

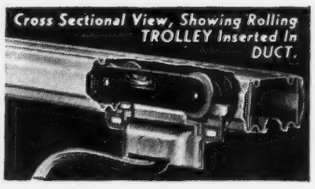
Above photograph shows part of a complete factory overhead lighting system of Bull Dog Universal Trol-E-Duct.

Why tolerate the LIMITATIONS and EXPENSE of a FIXED Lighting System? Why not have a modern FLEXIBLE Lighting System which permits you to instantly change the position or increase the number of your present Lighting units to meet changing working level requirements? Universal Trol-E-Duct—the System of Lights on Wheels—is just such a Flexible Lighting System. Every inch of it is a potential source of current for inserting additional or different Lighting units which, if desired, may then be moved in either direction along the Duct run.

Write For Illustrated Bulletin



Underneath view of DUCT in which Busbars are mounted and into which TROLLEYS are inserted.



Cross Sectional View, Showing Rolling TROLLEY Inserted In DUCT.

BULL DOG ELECTRIC PRODUCTS COMPANY

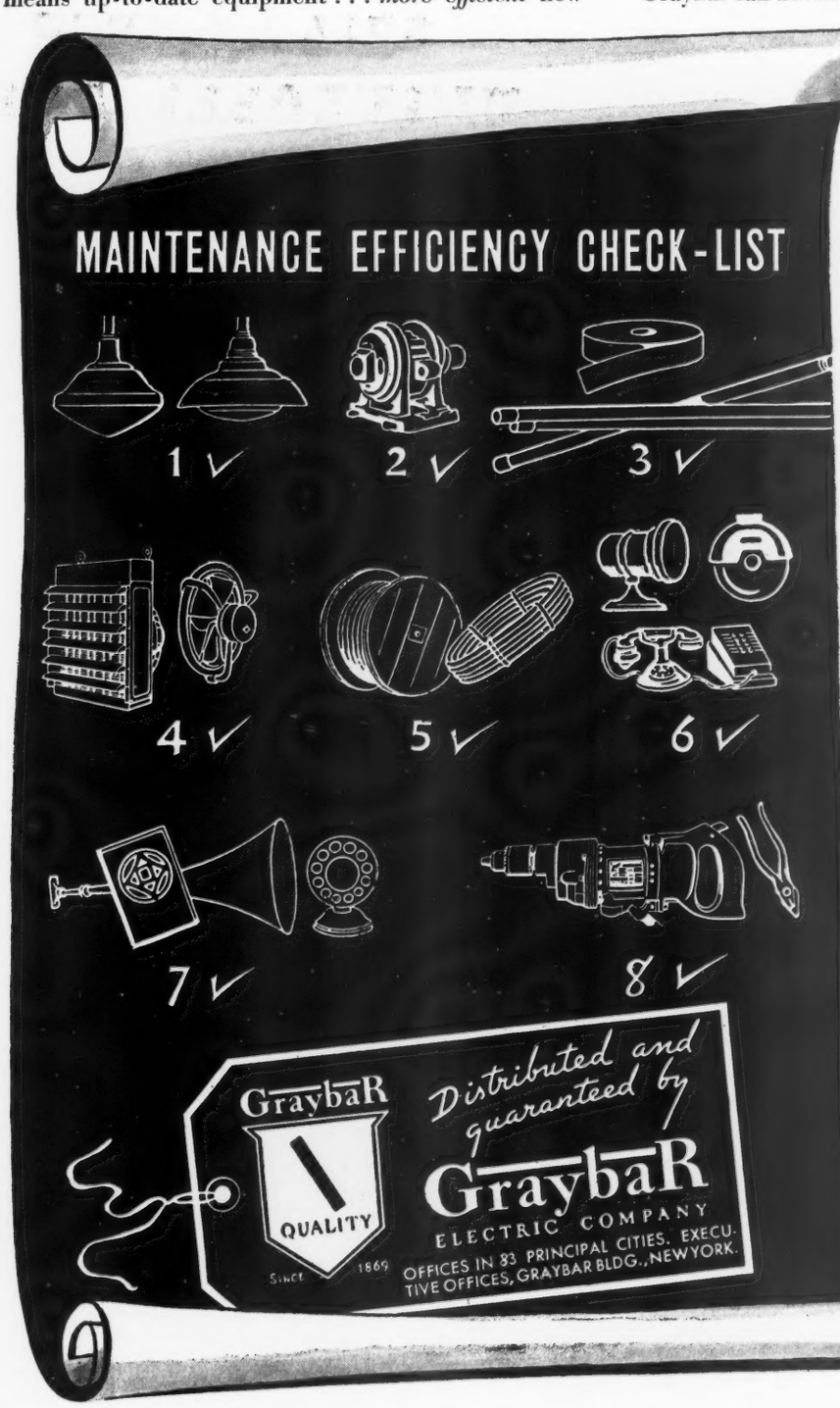
Pioneers of Flexible Electrical Distribution Systems

DETROIT, MICHIGAN

BULL DOG ELECTRIC PRODUCTS OF CANADA, LTD., TORONTO, ONT.

Now is the time to -
PLAN FOR PROFITS

THE key to profits . . . today and in the future . . . is constantly maintaining production efficiency. That means up-to-date equipment . . . *more efficient* new methods . . . planning ahead. Check your present electrical equipment. Is it adequate? Modern? Efficient? Graybar can advise you. Write us. Or ask our salesman.



1. LAMPS AND LIGHTING ... Better lighting is a paying investment. Definitely *increases production per man.* For expert advice — complete line of fixtures and glassware — Graybar.

2. MOTORS AND CONTROL ... Improvements have been made in motor design and applications. Re-plan. Turn to Graybar for convenient service on up-to-date motors and control.

3. WIRING SUPPLIES . . . Check over electrical work. Pinch-penny makeshifts cost money in the long run. Re-plan and replace with dependable electrical equipment from Graybar.

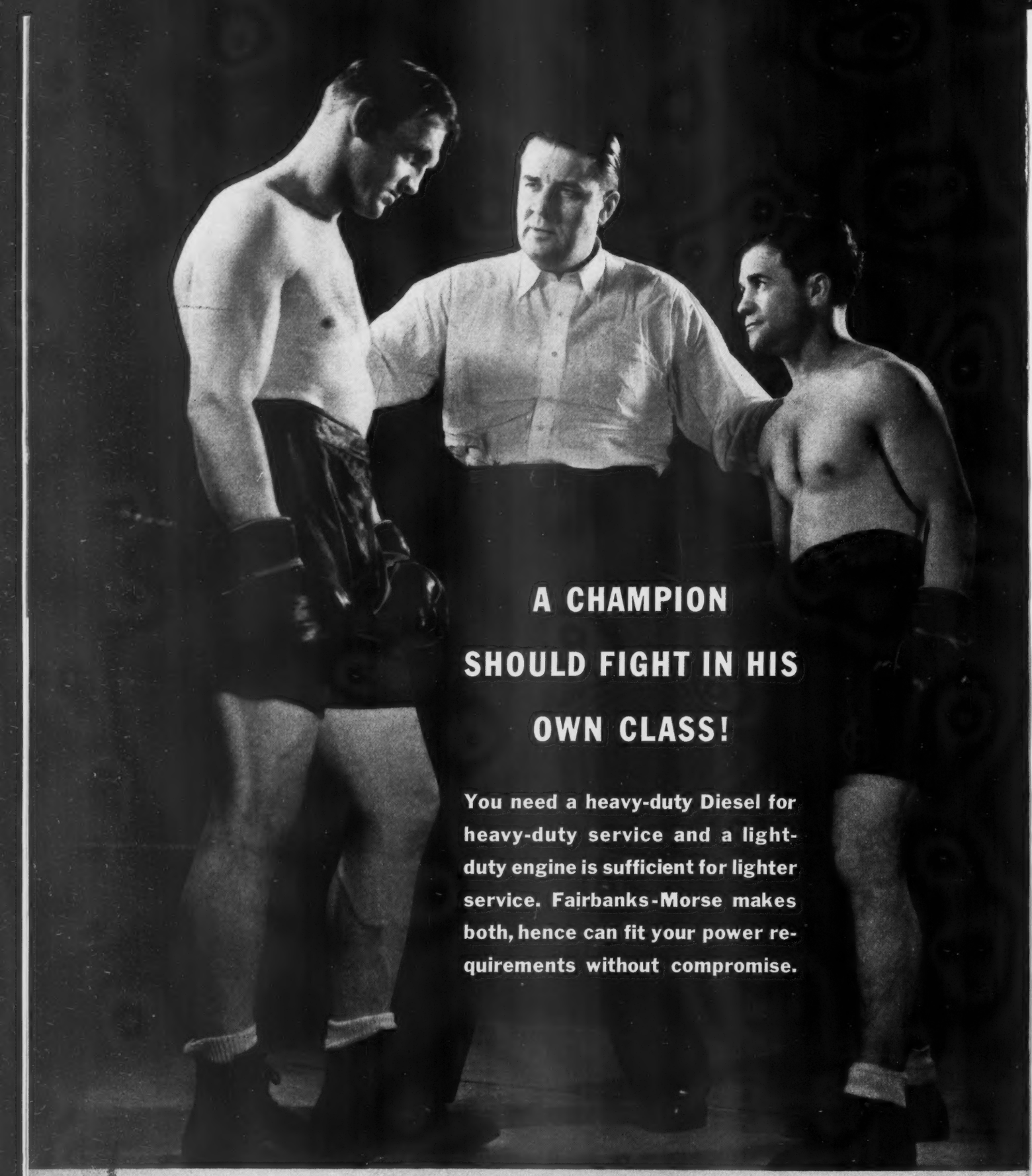
4. UNIT HEATERS... FANS . . . Good air, good work. Better ventilation increases efficiency. Yet an expensive outlay is not always necessary. Let a Graybar specialist advise you.

5. WIRE AND CABLE . . . Why struggle with out-worn wiring layouts? Simple changes can improve efficiency. We can help you. And supply the *dependable* kind of wire and cable.

6. SIGNALING DEVICES ... Signaling devices, Inter-Phones, save time, energies, money. Investigate! Graybar's experience goes back 67 years to the beginning of the industry.

7. SOUND SYSTEMS ... Investigate Western Electric systems for the pick-up, amplification, and distribution of sound. There are many interesting uses. Write us for full information.

8. TOOLS . . . Graybar, with its 60,000 electrical items, is the logical source of electrical tools for many special uses. A Graybar warehouse in your vicinity makes them available.



A CHAMPION SHOULD FIGHT IN HIS OWN CLASS!

You need a heavy-duty Diesel for heavy-duty service and a light-duty engine is sufficient for lighter service. Fairbanks-Morse makes both, hence can fit your power requirements without compromise.

FAIRBANKS MORSE Diesels

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
FAIRBANKS SCALES
RAILROAD EQUIPMENT
WATER SYSTEMS

REFRIGERATORS
RADIOS
WASHERS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS

TIME PROVES VALUES

OSBORN

Osborn Master Wheels are illustrated. Applications: general purpose cleaning, removing, roughening and finishing work. Made in sizes ranging from 4" to 15" diameters. Each Master Wheel has standard 2" opening. A set of Adapters of required arbor hole size furnished with each wheel. 14 sizes of Adapters ranging from ¼" to 1¾" arbor holes.

● Industry has learned to expect uniformly high standards of performance from Osborn Brushes. Dependable brush service combined with purchasing economy are the advantages gained when you *standardize* on Osborn Brushes. There's an Osborn Distributor in your vicinity . . . prepared to serve you promptly.

THE OSBORN MANUFACTURING COMPANY

5401 HAMILTON AVENUE • CLEVELAND, OHIO

Sales Offices: New York • Detroit • Chicago • San Francisco

Specify Osborn Brushes

THE MOST EXTENSIVE LINE OF INDUSTRIAL BRUSHES AVAILABLE FROM ANY SINGLE SOURCE

Three Ways to Use Glorified Light Products

THE SNOLITE SYSTEM—for all normal interior surfaces.

THE SNOTEX SYSTEM—for all abnormal interior surfaces except fungus growth. It resists discoloration from humidity, fumes, gases and lack of daylight.

THE FUNGUSIDE SYSTEM—to effectually retard the growth of fungus. It is valuable wherever bacteria and fungus must be continually combated.

★

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Pittsburgh Plate Glass Co.,
Paint Division, Dept. FM10, Pittsburgh, Pa.
Please send me, free, your new book, "Glorified Light".

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Address_____

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PAINT clear vision into every corner of your plant. Profit by greatly improved illumination at no increase in current cost. Finish your walls and ceilings with Pittsburgh Glorified Light products.

Pittsburgh scientists have perfected three Glorified Light systems to meet different factory conditions. Reflection control of all available raw light—natural and artificial—turns every foot-candle power into profitable illumination. Glorified Light eliminates glare and relieves eye strain.

Get all the money-saving facts about this improvement in industrial lighting from our instructive book—"Glorified Light". Use the coupon now for your free copy. Glorified Light pays quick dividends by removing many production hazards.

Pittsburgh Plate Glass Company, Paint Division, Pittsburgh, Pennsylvania.

Copr. 1937 Pittsburgh Plate Glass Co.

PITTSBURGH PAINTS
Smooth as Glass
COMPLETE LINE OF STRUCTURAL MAINTENANCE FINISHES

1937's
UNIT HEATING NEWS

Thermolier
DE LUXE TYPE

de luxe **HOUSING . .**
created by a leading industrial designer in crackle black and satin chrome . . modern design.

de luxe **PERFORMANCE**
resulting from the time-tested Thermolier heating unit, plus new louvres tilted at the exact angle for widespread distribution of heat.

• • •

Now a Thermolier de luxe type! The proved performance record of Factory and Industrial Type Thermoliers, *plus* appearance worthy of showroom, lobby or office, *plus* better distribution of heat!

Every one of Thermolier's famous 14 Points of Superiority are built into this new Thermolier. The exclusive Internal Cooling Leg that constantly removes "lazy water". . . the correctly pitched, expansion-bend tubes . . . the leak-proof joints . . . and eleven others.

The specially-designed motor and fan are completely concealed. Inlet and outlet pipes are at the rear. And Thermolier de luxe type carries on Thermolier's reputation as a miser of fuel in every installation.

You should know all about this new Thermolier. Write to-day for full particulars, without obligation. Grinnell Co., Inc., Executive Offices, Providence, R. I. Branch offices in principal cities of the U.S. and Canada.

18 MONTHS' RESEARCH ASSURES SATISFACTORY PERFORMANCE !

Consistent with the policy of Grinnell, a year and a half of intensive research was carried out on Thermolier de luxe type before its announcement. It is offered to you thoroughly tested, proved efficient and reliable.

GRINNELL THERMOLIER
THE UNIT HEATER WITH 14 POINTS OF SUPERIORITY

"There's THE Big REASON FOR LOWER COSTS IN THIS DEPARTMENT, CHIEF"

NOFUZE "DE-ION" CIRCUIT BREAKERS
100% Safety
PLUS
Important Savings

"You've got just as good men, and just as good machines in the other parts of the shop, chief—but the Nofuze breakers here make a BIG difference.

"You remember we put them in here because they give us greater SAFETY for the men and machines—but they've done more than that—they've kept the machines on this line running without interruption even with the extra pressure of rush orders we're having now."

This NOFUZE CIRCUIT BREAKER PROTECTS THE WORK OF 200 MEN...

●Once there was a fused switch here, protecting a main feeder circuit. Production records show that at least 6 times a year work was delayed by a blown fuse. Two hundred men stood idle while the fuse was being replaced. This circuit breaker cost $195. Each year it saves at least $300 in the time of men alone.

●Nofuze circuit breakers provide REAL SAFETY.

SAFETY TO WORKMEN—all live parts are totally enclosed—calibrated and sealed at the factory, they *never* need to be opened.

SAFETY TO MACHINES AND CIRCUITS—Nofuze breakers are *tamper-proof*. Their mechanism is *trip-free*—they can't be held closed against an overload.

This greater SAFETY makes possible substantial SAVINGS—which frequently pay for the cost of Nofuze breakers in a few weeks. Costly delays of men and machines—are completely eliminated. Nofuze breakers insure production schedules and profits. Investigate the increased SAFETY and assured SAVINGS Nofuze breakers can make in *your* plant. Call your nearest:

WESTINGHOUSE OFFICE
INDUSTRIAL AGENT
ELECTRICAL WHOLESALER
MOTOR DEALER

Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa.

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W WESTINGHOUSE ELECTRIC

Westinghouse

NOFUZE "DE-ION" CIRCUIT BREAKERS

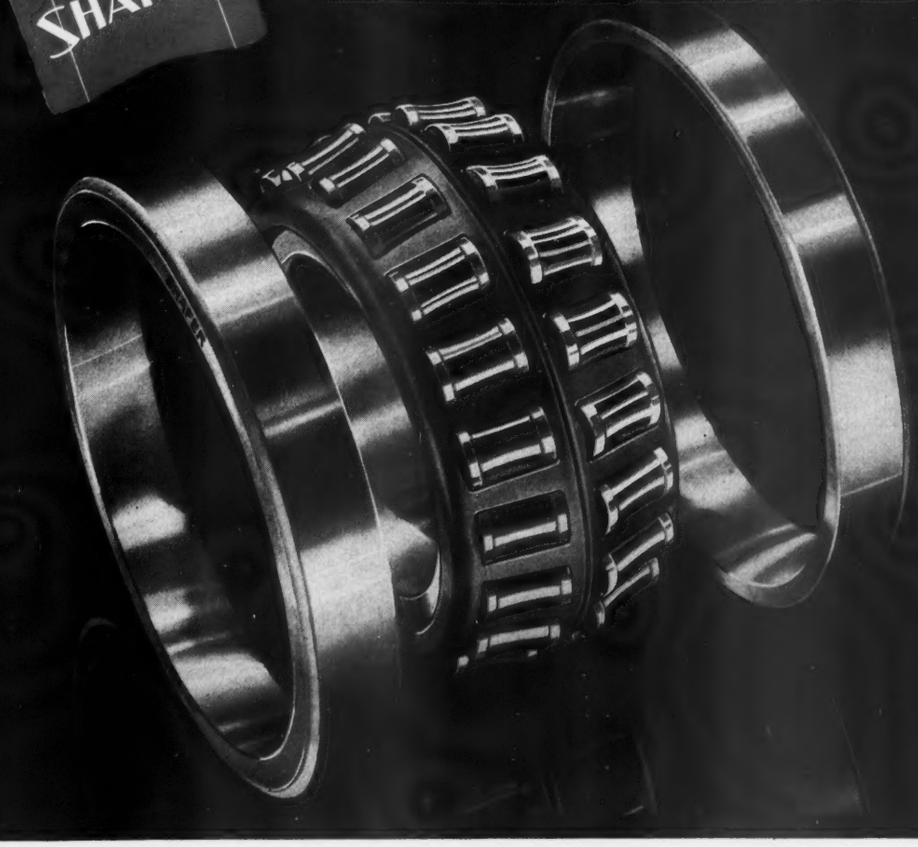
Thrust

Shafer CONCAVE roller design provides generous roller bearing capacity for the entire range of requirements from 100% radial to 100% thrust load. Radial or thrust loads alone, or combined loads in any proportion are provided for with a simple and economical Shafer application. Self-alignment within the bearing itself compensates for shaft deflection, shock load, or mounting inaccuracies.

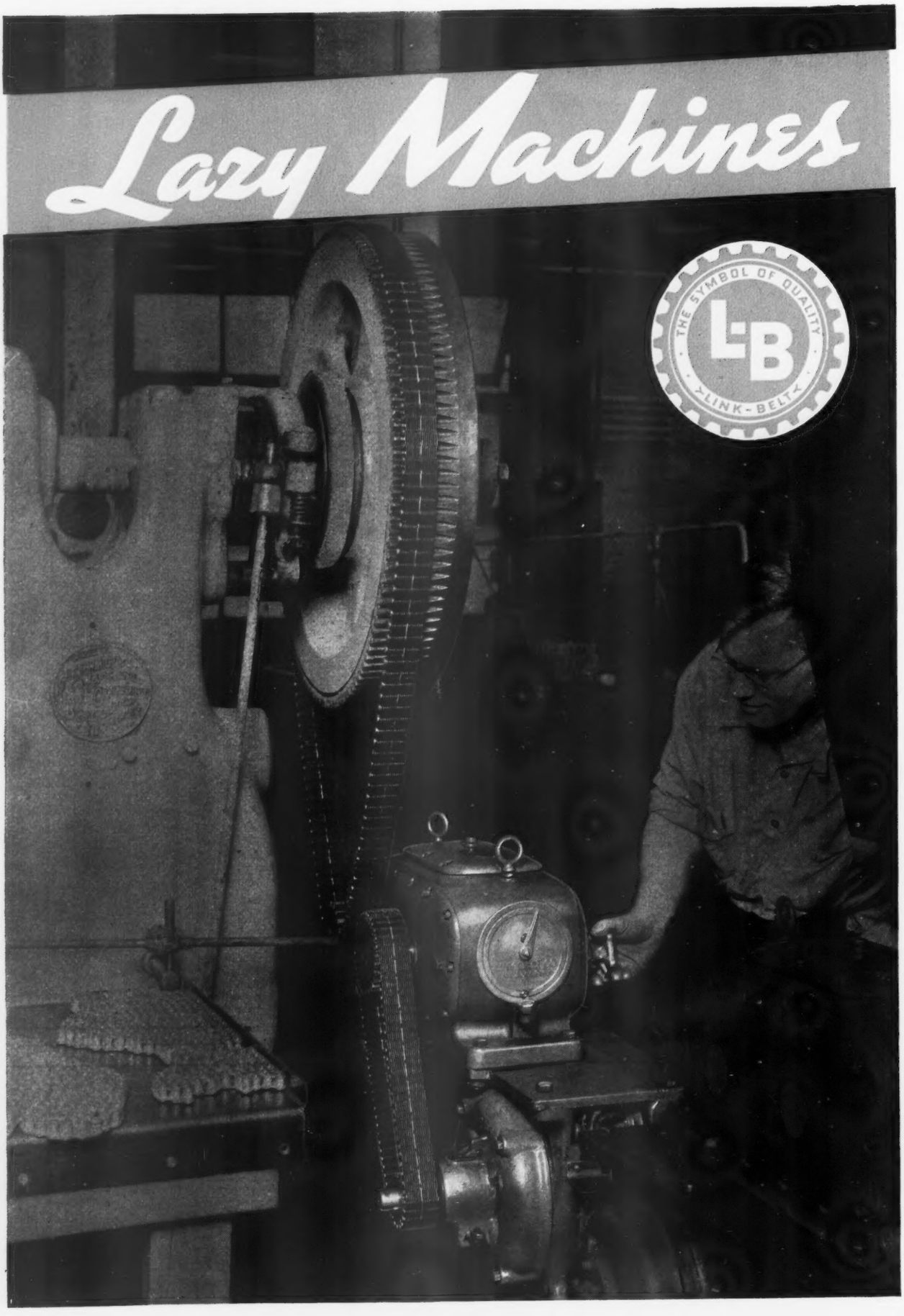
• . AVAILABLE IN A FULL RANGE OF SIZES •

PILLOW BLOCKS • FLANGE UNITS • TAKE-UP UNITS • HANGER BOXES • CARTRIDGE UNITS • DUPLEX UNITS • CONVEYOR ROLLS
RADIAL-THRUST ROLLER BEARINGS

SHAFER BEARING CORPORATION, 35 E. Wacker Drive, Chicago



EVERYTHING YOU NEED IN A ROLLER BEARING


Lazy Machines
THE SYMBOL OF QUALITY
LB
LINK-BELT

are Sneak Thieves..

BRING THEM UP TO FULL RATED CAPACITY WITH LINK-BELT POSITIVE DRIVES

● Machines are not, of course, actually lazy. But unless their output is equivalent to their full rated capacity, it amounts to the same thing — you are being robbed of production . . . profits.

Frequently the fault lies, not in the machine, but in the power transmitting medium. Drives that slip and jerk, fail to deliver full R.P.M. They render uniformity of product-quality uncertain.

Replacing inefficient drives with Link-Belt positive drives results in important output increases. By delivering the full power of the motor, in a smooth-flowing stream, machines produce at rated capacity.

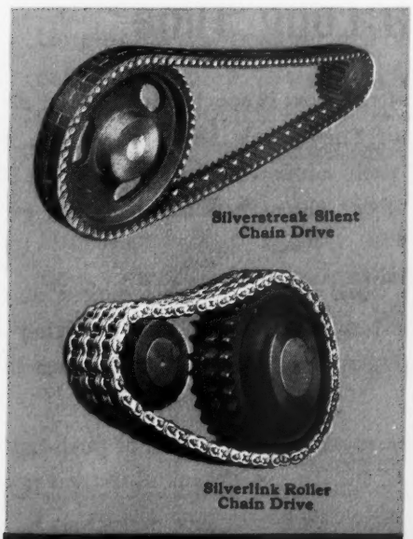
Link-Belt makes all seven types of positive drives, and can thus recommend the correct drive for any application. Whether you suspect any of your machines of being lazy or not, find out what a Link-Belt Positive Drive Specialist has to suggest.

LINK-BELT COMPANY

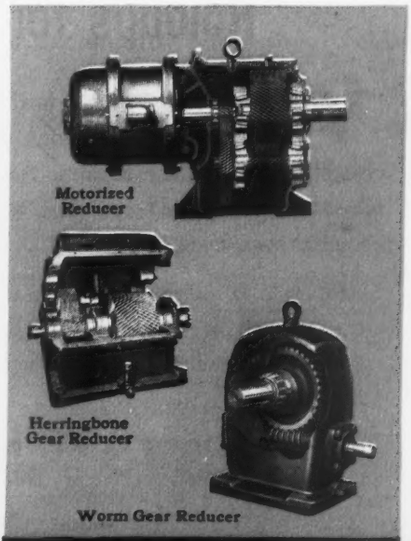
The Leading Manufacturer of Positive Power Transmitting Equipment

INDIANAPOLIS PHILADELPHIA CHICAGO ATLANTA SAN FRANCISCO TORONTO

Baltimore, Boston, Buffalo, Cleveland, Dallas, Denver, Detroit, Grand Rapids, Kansas City, Mo., Los Angeles, Louisville, Minneapolis, New Orleans, New York, Oakland, Calif., Pittsburgh, Portland, Ore., Seattle, St. Louis, St. Paul, Wilkes-Barre, Montreal, Vancouver. 7166



POSITIVE POWER TRANSMISSION

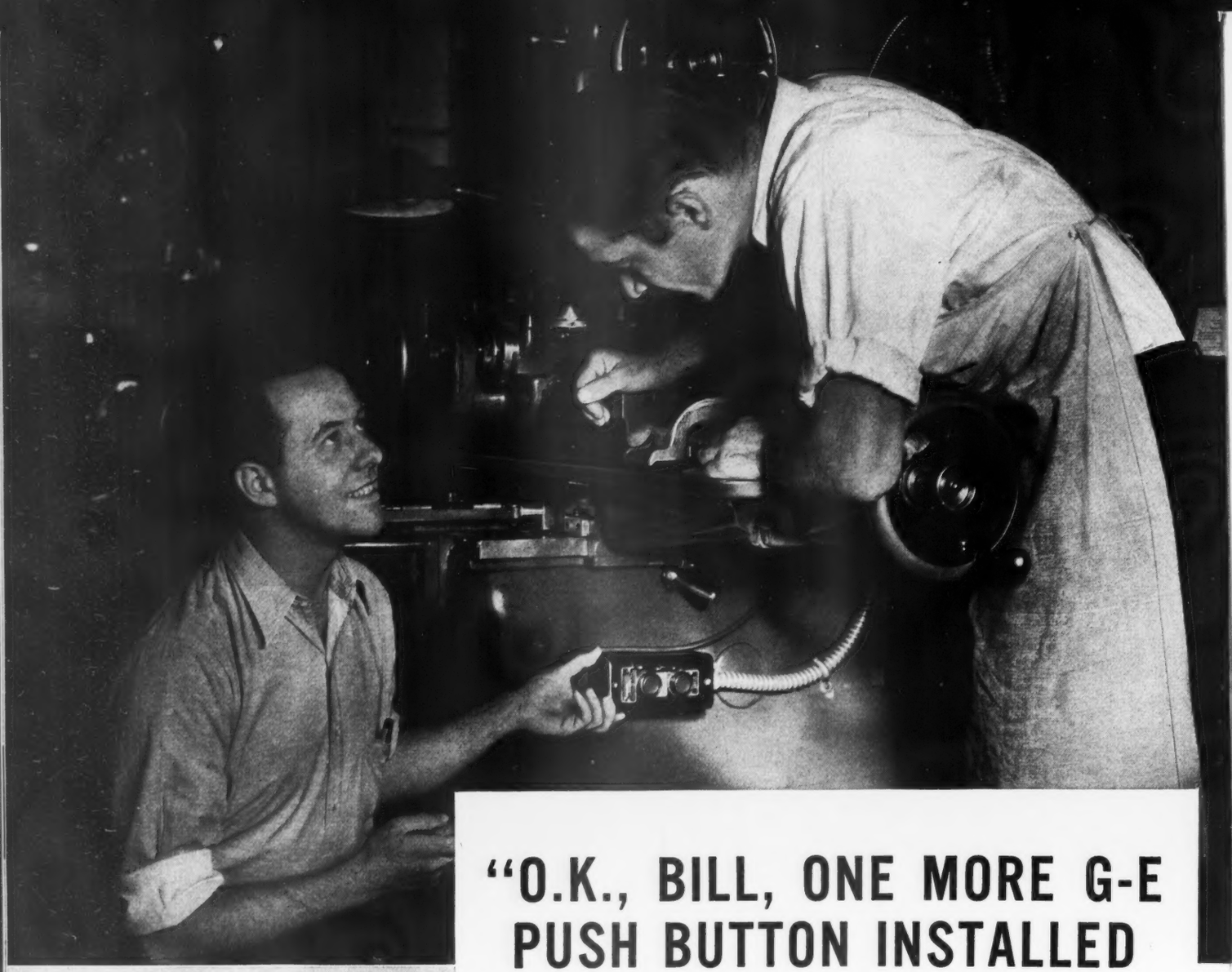


POSITIVE SPEED REDUCTION

POSITIVE VARIABLE SPEED CONTROL

SEND FOR THIS BOOK

8 complete catalogs bound as one book—covering the complete line of Link-Belt positive drives. Ask for Binder No. 2100. Also send for catalog covering the complete line of Link-Belt power transmission units such as anti-friction and babbitted bearing pillow blocks, clutches, couplings, take-ups, pulleys, gears, etc.



"O.K., BILL, ONE MORE G-E PUSH BUTTON INSTALLED

Now There Won't Be Any More Holdups for a Long Time"

"YOU'LL be as glad as I am that the Boss is specifying General Electric push-button stations now. They won't be tying you up and costing you time for repairs. And their silver contacts mean a lot less maintenance—they roll closed, and clean themselves automatically every time they are used."

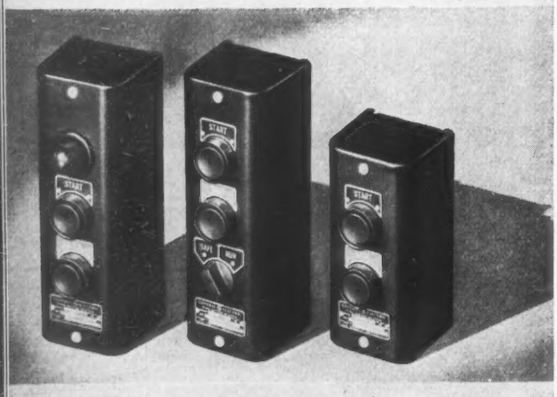
Installers and maintenance men who work with electric equipment all the time learn the big differences in push-button stations. That's why they are outspoken in their preference for G-E equipment. They say it makes their job far easier.

Foremen and managers also are enthusiastic about our line of push-button stations. It furnishes them a choice of station exactly suited to their needs. The attractive enclosures and sturdy mechanical and electrical design mean better-looking jobs, long life, and fewer maintenance calls.

We shall be glad to send you copies of our publications on all types of push-button stations. Just clip and mail the coupon to General Electric, Dept. 6A-201, Schenectady, New York.

GENERAL ELECTRIC

THREE TYPICAL MEMBERS OF A COMPLETE LINE



Please send me further information on the complete line of General Electric push button stations.

Name.....

Address.....

..... 080-132

Increase your profits with J&L STEEL

Instant steel service is YOURS

.... call your J&L Warehouse

Steel users large and small find Jones & Laughlin Warehouse Service fast . . . economical . . . complete . . . dependable. You, too, will get steel quickly . . . in ready-for-use form . . . from *your* J&L Warehouse.

J&L Warehouses are conveniently located. They carry high quality steel products to meet your individual requirements for safety . . . appearance . . . economy. Jones & Laughlin Warehouses are fully equipped for bending, forming, welding, cutting and fabricating steel to meet your *exact needs.*

Your J&L Warehouse saves you money and prevents delays. When time means money . . . for high quality steel products . . . order from your Jones & Laughlin Warehouse. Write today, on your business letterhead, for your J&L Warehouse Stock List.

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PITTSBURGH, PENNSYLVANIA

MAKERS OF HIGH QUALITY IRON AND STEEL PRODUCTS SINCE 1850

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Operated by Jones & Laughlin Steel Service, Inc., formerly National Bridge Works

MEMPHIS, 1 Auction Ave.—5-1623 . . . Distributing Warehouse for Pipe, Sheets, Spikes and Wire Products. Reinforcing Bar Warehouse and Fabricating Shop

FOR EVERY NEED . . . THE RIGHT QUALITY OF STEEL IN A FULL RANGE OF SIZES

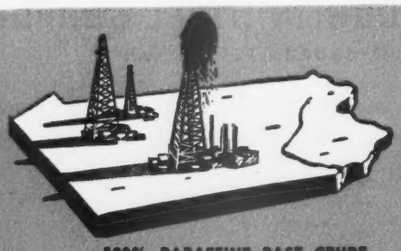
. . . "WE STAKED

INDUSTRIAL TYCOL OILS-GREASES

TIDE WATER

THERE IS A COMPLETE LINE OF TYCOL LUBRICANTS

The Flying Yankee, Crack Train of the Boston and Maine and Maine Central Railroad, is one of many Diesel powered units lubricated with Tide Water Diesel Lubricants.



100% PARAFFINE BASE CRUDE *assures* HIGHEST FLASH POINT

A NEW CLAIM"

"WE used to have plenty of trouble with carbon deposits in our steam engines," said a power plant superintendent. "We were using ordinary steam cylinder oil, but carbon on internal parts and in the packing glands convinced us we needed a change. We switched to Tycol Steam Cylinder Oil, and soon found that we had staked a new claim to economical, reliable lubrication."

Proper refining from the finest of crudes — the secret behind Tycol's unusual stability — is your insurance against objectionable deposits under high steam temperatures. The dependable operation, minimized wear and economical lubrication of Tycol Steam Cylinder Oil assure you a saving of power and maintenance costs. Tide Water's ability to select the right oil for every purpose, and Tide Water's engineering facilities give you the utmost in satisfactory lubrication. It will pay you to investigate! Have a Tide Water engineer survey your plant at no obligation to you.

TIDE WATER ASSOCIATED OIL COMPANY

TIDE WATER DIVISION
17 Battery Place, New York, N. Y.

INDUSTRIAL LUBRICANTS

SCIENTIFICALLY ENGINEERED FOR EVERY INDUSTRIAL USE

FLATTEST TEMPERATURE VISCOSITY CURVE
AND GREATEST RESISTANCE TO BREAKDOWN
giving
MAXIMUM ECONOMY AND PROTECTION FOR EVERY LUBRICATING DOLLAR

THIS CAN HAPPEN

There's a man outside guaranteeing increased production.

Research Belting will add 1 or 2% to that or we'll refund your money.

WE GIVE YOU A BONUS

Make a trial test of Research Belting on an important drive where increased production can be measured. It won't cost you a penny if production doesn't go up at least 1 or 2%.

GUARANTEE
Research Leather Belting will increase average machine production at least 1 or 2% over ordinary belting or the full purchase price will be refunded in exchange for the belting.
Graton & Knight Company

That's the guarantee. Now refer to THOMAS' REGISTER. In the belting section you'll see a Graton & Knight insert. In the listing on the back of it, find the jobber or sales office located nearest you. Arrange today — by phone or mail — for the "you-profit-or-we-pay" test.

I IN YOUR PLANT

He agreed to try it out for a month on an important drive.

That Research Belt is Okay. Production is up 3% on that machine.

Sor You get Your Money Back

USUALLY THE PRODUCTION INCREASE IS MORE THAN THE GUARANTEED MINIMUM!

Grinder:
8% more production an hour.

Blower:
Speed increased from 2700 to 2800 r.p.m.

Card:
4% more production.

Compressor:
So much more air from one, another could be shut down.

Head rig:
Research does twice as much work.

Linter:
Over 3 tons more per day.

Spinning frames:
15 feet more yarn per hour.

Drill:
25% saving in cost of operation.

Vertical drive:
9% more r.p.m.

Compressor:
17⅔ cents extra profit on each tank of chemical.

Generator:
15% more power.

Looms:
$2.88 a year bonus per loom.

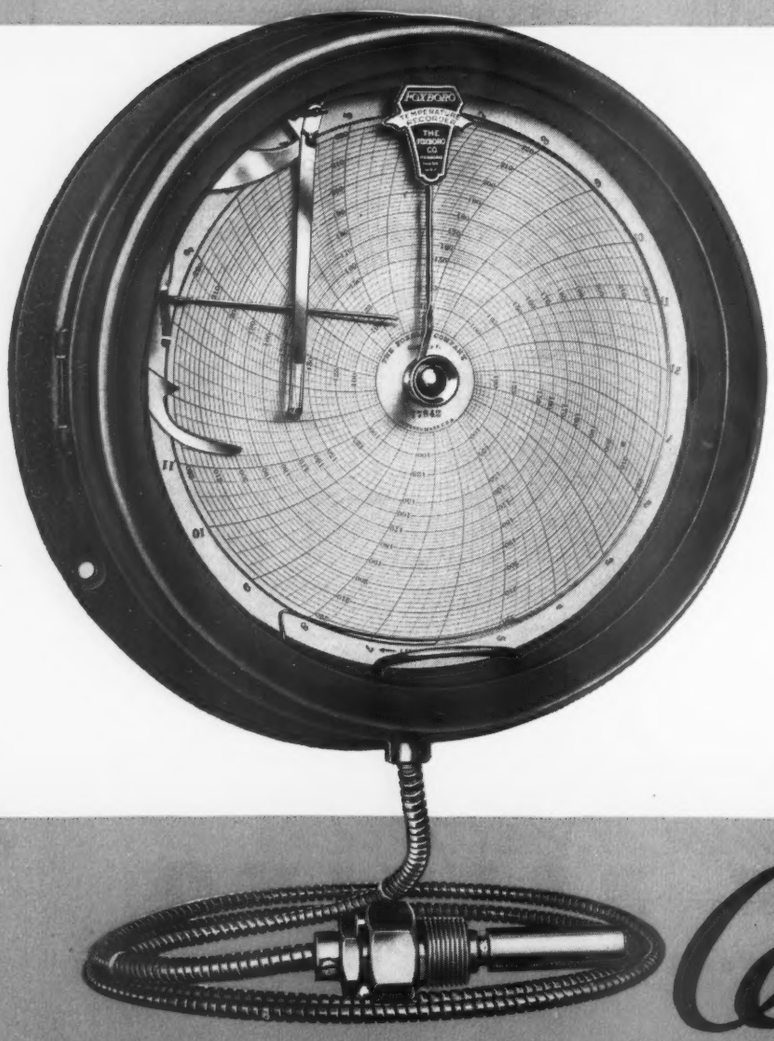
MODERN PTC GROUP-DRIVE

Graton and Knight

RESEARCH BELTING

from the Home of Research, Worcester, Mass.

NOW YOU CAN GET... *mono-* RECORDING



1. ***Faster response***—exact temperature on time.
2. ***More accurate***—precision over the entire scale range.
3. ***Last longer***—friction minimized; alignment permanent.
4. ***Less maintenance***—less wear and no leakage.
5. ***mono-therm System***—finest thermal unit construction.
6. ***Individually certified***—your guarantee of satisfactory instruments and performance.

Certified

mono-therm

THERMOMETERS

FROM long experience and constant improvement Foxboro has produced the new *mono-therm* Recording Thermometers. Every feature is time-tested and proved. The last word in design and construction, *mono-therm* Thermometers combine all the features that users in every branch of industry desire.

The thermal system has been made an enduring unit of unusual strength by means of a scientifically-controlled process. Added life is assured. Moving parts are light—yet strong. Fixed parts are rugged. Lost motion is banished. Every detail emphasizes the quality of workmanship, the design and engineering skill which assure unequalled response and accuracy over long periods of time.

All of this means just one thing . . . you get the most for your money when you buy Foxboro *mono-therm* Recording Thermometers. Write for Bulletin 198-1 . . . It describes the line in detail. The Foxboro Company, 24 Neponset Avenue, Foxboro, Massachusetts, U. S. A. . . . Branch offices in 25 Principal Cities.

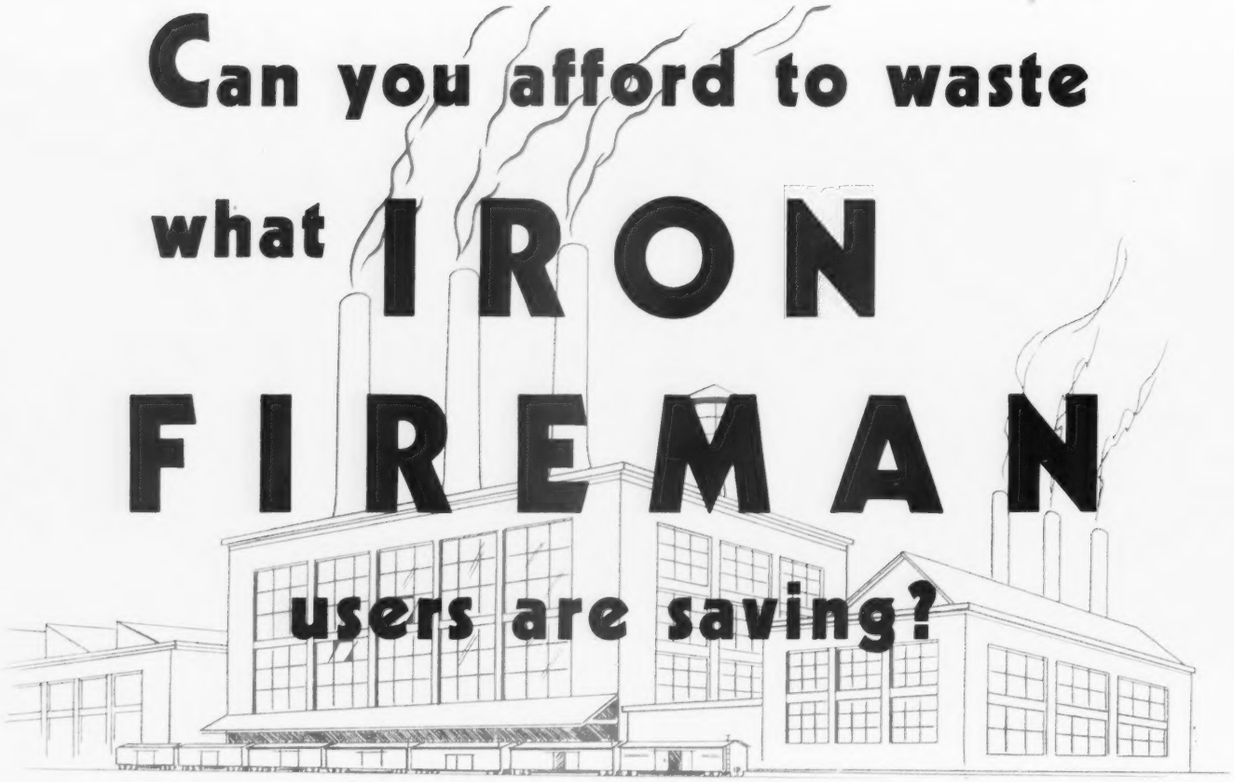
FOXBORO

REG. U. S. PAT. OFF.

RESPONSE

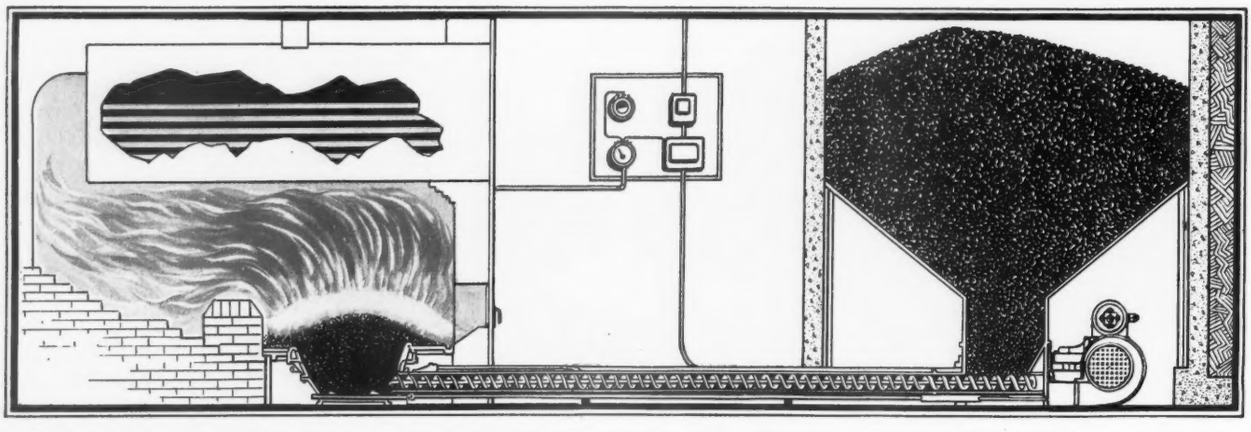
ACCURACY

Can you afford to waste what IRON FIREMAN users are saving?

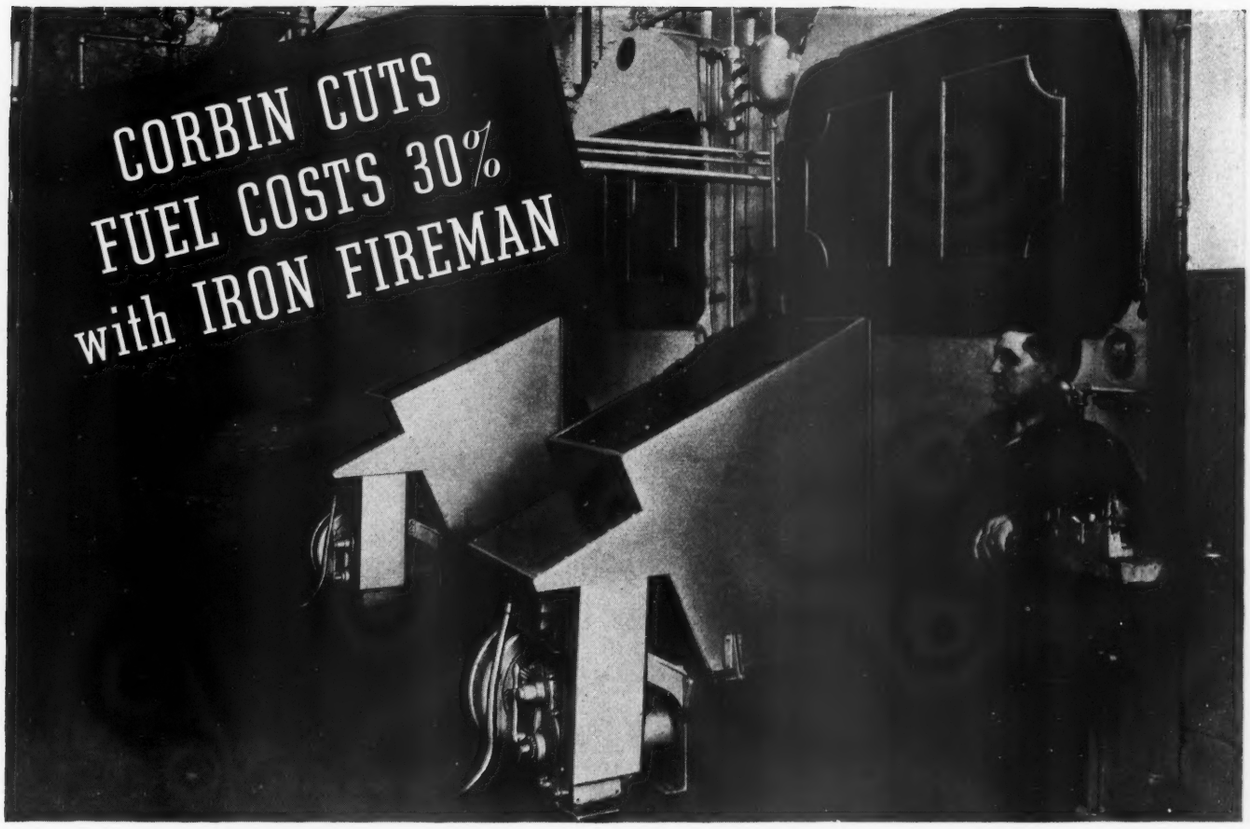


Cut operating costs in your factory with Iron Fireman automatic coal firing

AMERICAN factories are now saving millions of dollars annually with Iron Fireman firing. The fundamental reason for these savings is *low fuel cost*. Iron Fireman coal is *by far* the cheapest source of heat units nearly everywhere—cheaper than coal for hand-firing; far cheaper than liquid or gas fuels. Savings quickly pay for installation—earn continued profits on the investment of 25% to 100% and more a year! What other safe investment will earn *half as much*. Iron Fireman stokers convert low-cost stoker coal into clean heat—clean in the boiler room; clean throughout the building; clean outdoors. Iron Fireman combustion is so scientific that the smoke nuisance is entirely eliminated.



No Coal Handling: Iron Fireman stokers can be installed to feed direct from the coal bin or bunkers, thus eliminating coal handling entirely as the coal can be delivered direct to the bunker from the truck or cars. Such installations are models of cleanliness and convenience. They are inconspicuous, and require a minimum of attention.



Iron Fireman stoker installations at the Corbin Lock Co. of Canada, Limited. Engineer Fred Voisin at right.

HERE IS PLANT MODERNIZATION THAT PAYS BIG DIVIDENDS

THE Corbin Lock Company knows no compromise with quality in the products it manufactures, nor in the equipment that it uses.

Corbin adopted Iron Fireman stokers in its Belleville, Ontario, plant in 1931, when installations were made under two Inglis Supreme 125 h.p. boilers. These stokers have been in constant operation. They have been responsible in effecting at least a 30% saving in fuel, and they have maintained steady even heat regardless of weather conditions.

L. E. McLean, Manager, says: "During the past 5 years there has been no maintenance cost. In fact, we have required but one service call since the installation. During the coldest weather, with temperatures as low as 40 degrees below zero, we maintained even heat through our plant and used only one boiler. While we have two stokers installed, we alternate their operation because we have found that one boiler plus Iron Fireman is sufficient to keep the building at a constant temperature. Iron Fireman has been most satisfactory in every way."

Corbin plant at Belleville, Ontario.

FREE FIRING SURVEY

If you are considering the purchase of a stoker for a new or modernized boiler room, let the Corbin experience with Iron Fireman be a buying guide. Get the complete Iron Fireman story, and then check with Iron Fireman owners. Clip and mail the coupon below for literature or ask your Iron Fireman dealer to make a free firing survey of your heating or power plant. His report will show the savings and improvements that you can expect with Iron Fireman firing. The Iron Fireman line includes Hopper and Bunker-feed models for boilers developing up to 500 h.p.. Purchase may be made on a convenient monthly payment plan. Iron Fireman Manufacturing Company, Portland, Oregon; Cleveland; Toronto. Dealers everywhere.

IRON FIREMAN

AUTOMATIC COAL FIRING EQUIPMENT

IRON FIREMAN MFG. CO.
3008 W. 106th St., Cleveland, Ohio.

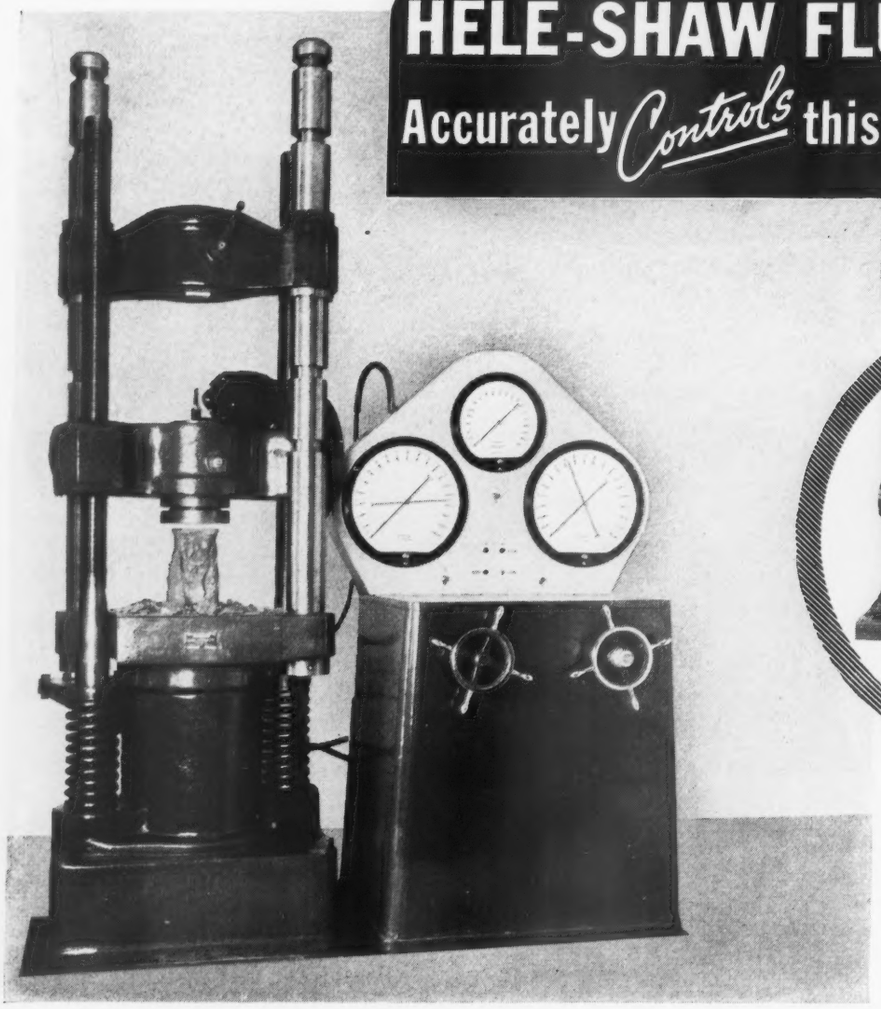
☐ Please make boiler room survey
☐ Send literature

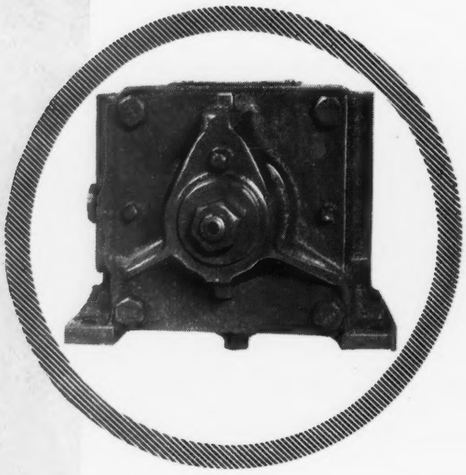
OUR CATALOG IS FILED IN SWEET'S

Name _____

Address _____

HELE-SHAW FLUID POWER
Accurately *Controls* this Testing Machine





This illustration is actually one-fifth the size of the Hele-Shaw Pump that powers the 300,000 lb. Southwark-Emery Testing Machine.

This 300,000-pound Southwark-Emery Universal Testing Machine crushes concrete specimens or pulls apart steel bars. . . . The ease with which it performs these tasks compels you to ask "How is it done?" . . . It's *done* with Hele-Shaw Fluid Power. A small Hele-Shaw Pump, occupying a space only 10" x 9⅛" x 7⅝", sends high pressure *Fluid Power* (oil under pressure) to the testing machine. Hele-Shaw Fluid Power is subject to exceptionally accurate control. A touch on a handwheel applies Hele-Shaw Fluid Power g-r-a-d-u-a-l-l-y, precisely, to the specimens. This is necessary to simulate actual loading conditions or to duplicate exactly testing conditions in order to compare various samples with accuracy. . . . Hele-Shaw Fluid Power is widely used in hydraulic press type machines because of its high pressure and the ease of controlling it manually or automatically. Rams driven by it can be infinitely adjusted over a wide range of speeds, stopped or started in an instant. Look into these and the many other advantages of driving with Hele-Shaw Fluid Power. Our engineers will gladly show you how to produce variable, reversible, controllable linear or rotary motion with Hele-Shaw Fluid Power, or write for our Catalog F.

A-E-CO HELE-SHAW *Fluid Power*

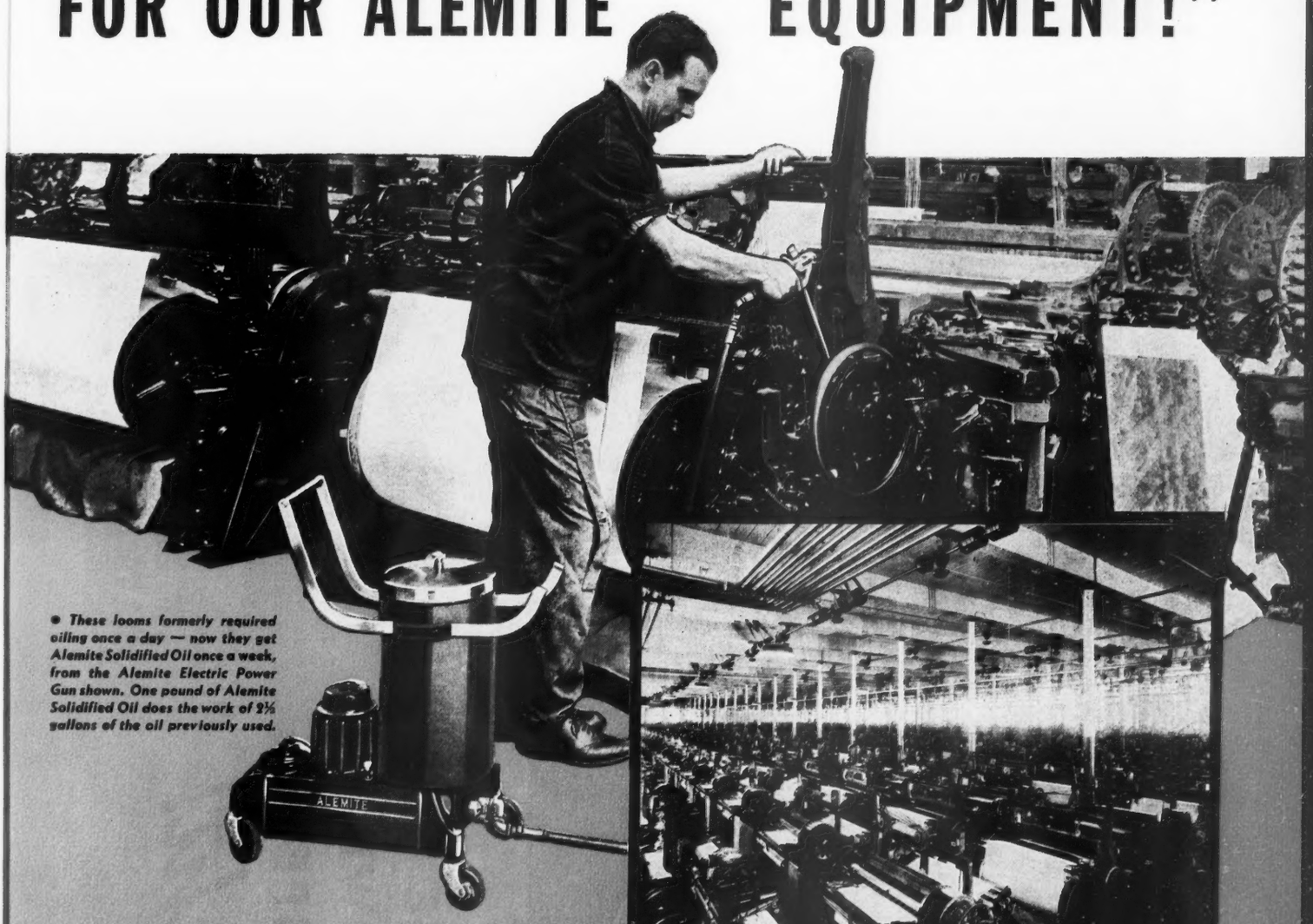
AMERICAN ENGINEERING COMPANY

2426 ARAMINGO AVENUE, PHILADELPHIA, PENNA.

A-E-CO HELE-SHAW PUMPS, MOTORS AND TRANSMISSIONS

Other Products: A-E-CO Taylor Stokers, A-E-CO Lo-Hed Monorail Electric Hoists, A-E-CO Marine and Yacht Auxiliaries

"Alemite Lubricants SAVED US MORE THAN ENOUGH IN ONE YEAR TO PAY FOR OUR ALEMITE EQUIPMENT!"



• *These looms formerly required oiling once a day — now they get Alemite Solidified Oil once a week, from the Alemite Electric Power Gun shown. One pound of Alemite Solidified Oil does the work of 2½ gallons of the oil previously used.*

THINK of it! Berkshire Mills of Fall River, Mass., saved enough on lubricants *in one year* to pay for 3 electric Alemite Power Guns and all their other Alemite Lubrication Equipment! They did this by adopting Alemite Solidified Oil for lubrication of looms, and Alemite Concentrated Oil for comb boxes on their carding machines.

And that's just one typical example of what Alemite Specialized Lubricants are doing for every kind of industry! There's *Alemite Viscous H*, famous for its resistance to water and its ability to adhere to bearings. It is equally suitable for many industrial requirements as well as for chassis bearings in trucks. *Alemite 600 M.P.*, for use under temperatures up to 600°F., is doing countless jobs which some folks said couldn't be done! And for open gears there's nothing like *Alemite Gear Coating*. It can't be "thrown"—it sticks to the gears and *lubricates!*

You'll find complete information on these and dozens of other Alemite Specialized Lubricants for industry in the complete new Alemite Industrial Lubrication Manual. This comprehensive handbook cost us thousands of dollars to prepare. You may have your copy FREE for the asking. Mail the coupon today!

ALEMITE—*A Division of Stewart-Warner Corporation*
1870 Diversey Parkway, Chicago, Illinois
Stewart-Warner-Alemite Corporation of Canada, Ltd., Belleville, Ontario

ALEMITE

REG. U. S. PAT. OFF.

WORLD'S LARGEST MANUFACTURERS OF LUBRICATION PRODUCTS

Enjoy Horace Heidt and his Alemite Brigadiers every Monday evening, over Columbia Coast-to-Coast Network. See local papers for time of broadcast.

ALEMITE—*A Division of Stewart-Warner Corp.* Dept. J
1870 Diversey Parkway, Chicago, Illinois

Please send my FREE copy of your Alemite Industrial Lubrication Manual.

Name _____

Address _____

City _____ State _____

Firm Name _____

Another Triumph by TRANE

THE NEW Round PROJECTION HEATER

Ceiling Mounted

Heating THE WORKING ZONE WITH THE EASE AND SPEED OF Light!

ANNOUNCEMENT of the Trane Projection Heater is distinctly heating news, for this startling development does what no other unit heater has been able to do. Heretofore it has been impractical to mount a unit heater at the ceiling, regardless of height, to take efficient advantage of the great mass of hot ceiling air which normally floats in the high upper area of any heated space.

Mounted flat at the ceiling—an exclusive Trane development—the Trane Projection Heater completely blankets the working or living area with an even, comfort temperature, and just sufficient air motion to prevent either the "blasting" of the old type of unit heater or the dead air sensation resulting from the conventional radiator type heating system.

EIGHT POINTS OF SUPERIORITY

QUICK HEAT! Quick heat in the working zone. The Trane Projection Heater in tests has been able to heat a given space more quickly than any conventional heating system.

NEW WORKING ZONE COMFORT! Heat distribution where it is needed in the working zone, due to the round coil construction, the Trane designed fan, and the high ceiling mounting.

MAINTAINED EVEN TEMPERATURE! Even temperature constantly maintained by the quiet downward distribution of heat and its recirculation to the working zone as fast as it rises.

INCREASED HEAT SPREAD! Greatly increased coverage of areas to be heated—a definite result of the construction and mounting of the heater.

NEW QUIETNESS! The Trane Four-Blade Propeller Fan is especially designed to insure quietness as well as uniform efficiency, while the motor mounted in three-point resilient suspension, is practically noiseless, and saving in power.

NEW ECONOMY! It is obvious that the revolutionary construction and the method of heat distribution of the Trane Projection Heater will assure real economy.

OPERATES ON HIGH OR LOW STEAM PRESSURE, with no expansion problem.

TROUBLE-FREE SERVICE! The simple but sturdy construction of the Trane Projection Heater assures constant, dependable service over a long period of years.

THE Trane Projection Heater literally projects and diffuses heat from the ceiling to the floor and, when the heat rises again, recirculates it to the living or working area. It thus overcomes the chief drawback to proper heat circulation, that condition referred to by engineers as "ceiling stratification" or "cold 70 in the living zone."

A SIMPLE COMPACT UNIT

The Trane Projection Heater is a simple, compact unit, round in design, built of circular Trane Coils which surround a specially designed Trane 4-blade propeller fan. The coils are open throughout their entire circumference, being held in place by two plates. The upper or ceiling plate carries the motor, while the lower, or "orifice" plate, permits the free projection of heat by the propeller fan. Due to the circular coil construction, all expansion problems vanish. The same unit may be used for high or low pressures.

CEILING MOUNTING ADVANTAGES

The flat ceiling mounting of the fan—made possible by this design and the new direct flow principle—is an outstanding feature of the Trane Projection Heater. Due to the design efficiency of the unit, it can be mounted at a distance as high as 30 feet or more from the floor, which makes it possible to take advantage of all hot ceiling air. The significance of this feature cannot be overemphasized. The unit is also out of the way, providing for the greatest use of the heated space. This high ceiling mounting is an advantage absolutely impossible in other types of unit heaters.

The combination of greater heat spread and complete removal and recirculation of heat normally found at the ceiling to the lower strata, where it is needed, plus the ceiling mounting, make the Trane Projection Heater a remarkable contribution to the problem of heating any area in structures where space heating is applicable.

THE HEAT EQUALIZING SYSTEM

The Trane Projection Heater has made possible the creation of another exclusive Trane development—the Trane Heat Equalizing System. This consists of a series of Trane Projection heaters mounted at the ceiling and so regulated by thermostats that all or one can be operated at a time, or the fans can be operated for recirculation only.

The Trane Heat Equalizing System completely overcomes air stratification—wasted heat at the ceiling—maintaining a gentle, warm circulation of air at the working level.

FULL DETAILS IN BULLETIN

Installation of one Trane Projection Heater will give an entirely new experience in heating comfort. Mail the Trane-O-Gram for complete information about this remarkable heater.

SEND **TRANE-O-GRAM** TODAY

The Trane Co.
2011 Cameron Ave., La Crosse, Wis.
We wish your Bulletin No. 284 with complete information on the Projection Heater.

Firm _____

Address _____

THE TRANE COMPANY

HEATING · COOLING · VENTILATING

EVERY DAY new machines are put to work in America's industrial plants to manufacture better commodities at higher speed and lower cost. And each advance gives new impetus to our ever rising standard of living.

To the genius of America's machine designers goes all praise for these achievements.

Yet without a like advancement in the science of lubrication, these modern machines would be of little benefit to industry. For no machine can perform without oil; and with each advance in machine design and speed comes a greater need for effective lubrication

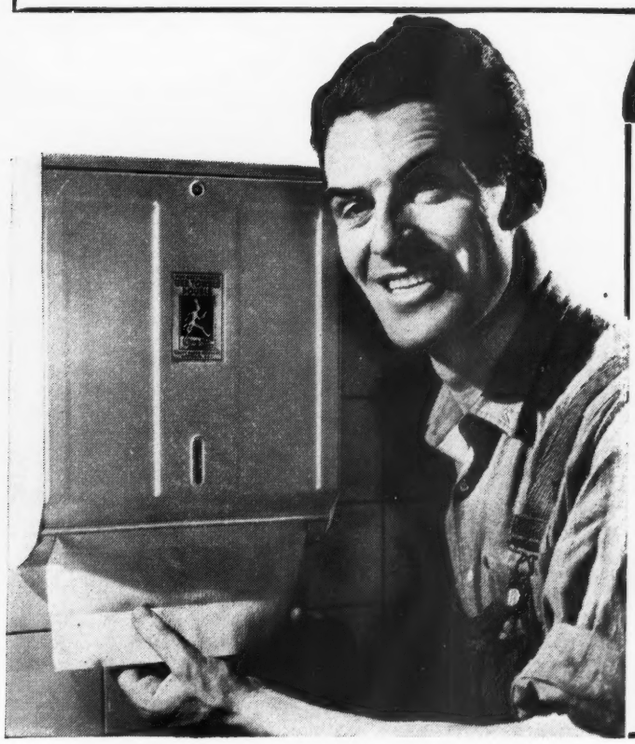
To deal with the problems that grow out of these mechanical developments, Gulf has equipped its laboratories with instruments and machines that put lubricants to the severest tests.

Behind the scenes of American industry today is a group of Gulf scientists who work each day to find better methods and better oils to lubricate machinery. No lubricant is placed in service in the field until it has been thoroughly proved as best for its purpose.

This is why Gulf can make this pledge to industrial plant operators: *Lubrication will continue to keep pace with the technologic advance of industry.* Gulf has the men, materials and equipment to manufacture the finest oils and greases for the machinery of today—and for the machinery of tomorrow as well.

GULF INDUSTRIAL LUBRICATION

LAST WEEK THE BOSS USED OUR WASHROOM—



NOW WE'VE GOT SCOTTISSUE TOWELS!

MANY "BOSSES" could profitably visit their employees' washrooms as often as they inspect the plant. They'd frequently learn that inadequate washroom facilities foster *unnecessary* dissatisfaction.

Employees look for the same sanitary conveniences that they enjoy at home. And a clean, efficient washroom represents a small but important investment in better employee morale.

"Washing-up" can be clean and satisfying for *both* the boss and worker with sanitary, comfortable ScotTissue Towels. They s-t-r-e-t-c-h to *dry* the hands and face. One is enough, and economical cabinets serve a fresh one for every using. Let ScotTissue Towels build good will and satisfaction for you, as they have for leading companies throughout the country.

Test the low cost of this necessary service now. A request on your letterhead will bring you a sample supply. Scott Paper Company, Chester, Pennsylvania.

. . .

SCOTTISSUE, the same toilet paper that is preferred in millions of homes, is now available in Service-Roll form to large industrial users, at surprisingly low cost.

Thirsty Fibre Really DRIES

ScotTissue Towels

BY THE MAKERS OF SCOTTISSUE, WALDORF, AND SCOTTOWELS FOR HOMES

PREVENT FOUNDATION LEAKS WITH

KOPPERS WATERPROOFING

Koppers Membrane Waterproofing

Many of the troubles which develop in concrete or masonry basements, foundations, walls, abutments, tunnels, shafts, sidewalk vaults, storage pits, etc., are due to the lack of waterproofing, or the use of inadequate types of waterproofing.

Wherever a head of water is encountered, Koppers Membrane Waterproofing should be used. It is constructed in place by mopping plies of Koppers Tar-saturated Open Mesh Cotton Fabric or Koppers Tarred Felt with Koppers Waterproofing Pitch, as shown in diagram No. 1 on this page.

We will be glad to send you complete specifications for waterproofing any type of structure.

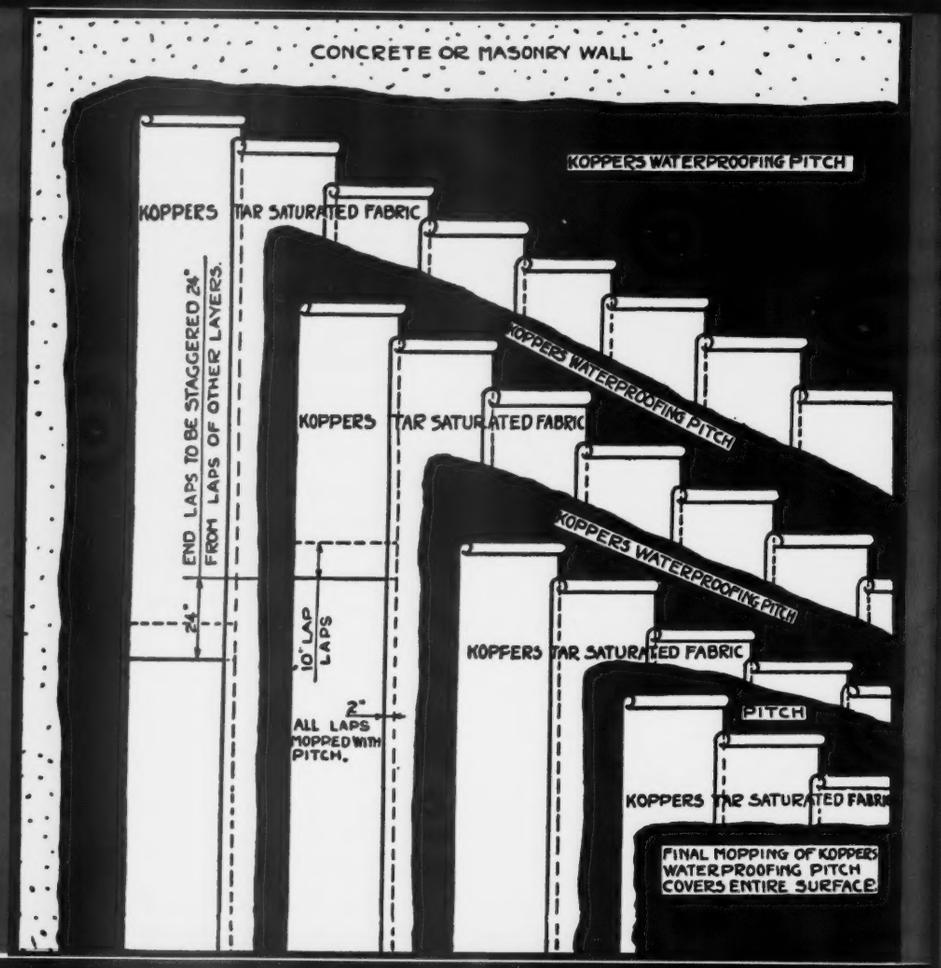

CONCRETE OR MASONRY WALL
KOPPERS WATERPROOFING PITCH
KOPPERS TAR SATURATED FABRIC
END LAPS TO BE STAGGERED 24" FROM LAPS OF OTHER LAYERS.
KOPPERS WATERPROOFING PITCH
KOPPERS TAR SATURATED FABRIC
24"
10" LAP LAPS
2"
ALL LAPS MOPPED WITH PITCH.
KOPPERS WATERPROOFING PITCH
KOPPERS TAR SATURATED FABRIC
PITCH
KOPPERS TAR SATURATED FABRIC
FINAL MOPPING OF KOPPERS WATERPROOFING PITCH COVERS ENTIRE SURFACE.

Diagram No. 1—Typical application of Koppers 4-ply Membrane Waterproofing.

Koppers Divisions, Subsidiaries and Affiliates Serving the Manufacturing Industries

AMERICAN HAMMERED PISTON RING DIVISION — BALTIMORE, MD.

BARTLETT HAYWARD DIVISION — BALTIMORE, MD.

ENGINEERING AND CONSTRUCTION DIVISION — PITTSBURGH, PA.

GAS AND COKE DIVISION — PITTSBURGH, PA.

TAR AND CHEMICAL DIVISION — PITTSBURGH, PA.

WESTERN GAS DIVISION — FORT WAYNE, IND.

EASTERN GAS AND FUEL ASSOCIATES — BOSTON, MASS.

THE KOPPERS COAL COMPANY — PITTSBURGH, PA.

NEW ENGLAND COAL & COKE COMPANY — BOSTON, MASS.

THE WHITE TAR COMPANY OF NEW JERSEY, INC. — KEARNY, N. J.

THE WOOD PRESERVING CORPORATION — PITTSBURGH, PA.

NATIONAL LUMBER & CREOSOTING COMPANY — TEXARKANA, ARK.-TEX.

●

Kopper Principal Products for the Manufacturing Industries

Koppers Roofing ... Waterproofing ... Dampproofing ... Bituminous Paints ... American Hammered Piston Rings ... Fast's Self-aligning Couplings ... Platework ... Tanks ... Cast Iron and Steel Pipe ... Gas, Air, Water, Tar Valves ... D-H-S Bronze Castings ... Iron Castings ... Western Fire Hydrants ... Locomotive Packing ... Creosote Oil ... Treated Timber and Lumber ... Materials-Handling Equipment ... Tarmac Paving Materials ... Coal ... Coke ... Gas ... Disinfectants ... Insecticides ... Deodorants ... Pipe ... Weed Killers .. Tar Acids .. Light Oils .. Naphthalene

Koppers Dampproofing

There are a number of methods of Koppers Dampproofing, each adapted to different conditions. Diagram No. 2 on this page shows the method of dampproofing and termite-proofing by the Koppers Pitch Method. We will be glad to send you specifications for this and for the High Penetration Method.

Write for the Koppers Specification Book dealing with the whole problem of protecting foundations.

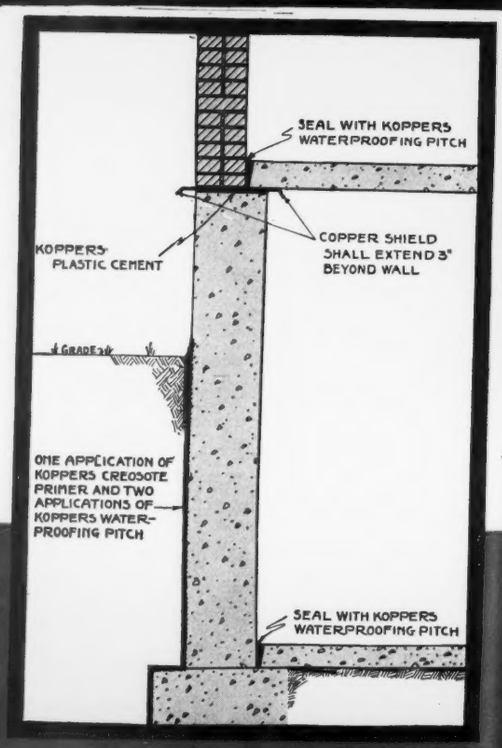

SEAL WITH KOPPERS WATERPROOFING PITCH
KOPPERS PLASTIC CEMENT
COPPER SHIELD SHALL EXTEND 3" BEYOND WALL
GRADE
ONE APPLICATION OF KOPPERS CREOSOTE PRIMER AND TWO APPLICATIONS OF KOPPERS WATERPROOFING PITCH
SEAL WITH KOPPERS WATERPROOFING PITCH

Diagram No. 2—The Koppers Pitch Method of Dampproofing and Termite-proofing.

KOPPERS COMPANY
Tar and Chemical Division
PITTSBURGH, PA.

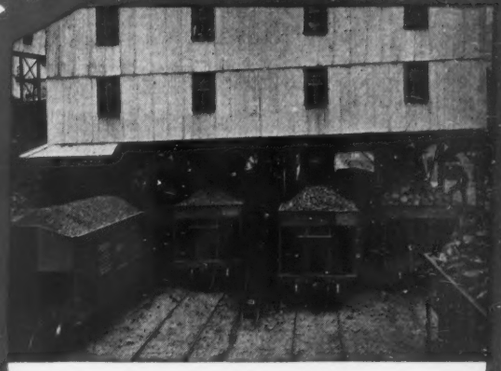
A KOPPERS COAL FOR EVERY PURPOSE

Koppers offers not only a wide variety of superior coals, but a service that assists in selecting the right grade for each specific need. A Koppers service man may be able to show you unsuspected waste in your present fuel utilization, point out means of making substantial savings. Will you give him the opportunity?

THE KOPPERS COAL COMPANY
Pittsburgh, Pa.

Selection of the proper grade of coal for each use is made possible by a program of laboratory tests. Research is continuously carried on, holding Koppers quality at a consistent high. The services of the trained personnel are available for special analyses, testing, or investigation.

Preparation of Koppers Coal is thorough and painstaking. Equipment is modern, and includes picking, shaker-screening, and boom-loading. Much of the coal is washed in Koppers Rheolaveurs. The inspection department works for YOU . . . they reject at the first sight of sub-standards, and there is no appeal from their decision.



Koppers capacity totals 15,000,000 tons annually. Delivery facilities include "all-rail" shipments to market; delivery to lake ports; and to tide-water piers. Koppers has the largest fleet of colliers on the Atlantic Coast. Nine railroads serve Koppers mines. Branch offices are located in principal cities.

KOPPERS COMPANY

DESIGNERS · BUILDERS · PRODUCERS · MANUFACTURERS · DISTRIBUTORS · OPERATORS

Small Motor Starting Switches

Across-the-Line Type Tumbler Switches, without overload protection... Give positive control for motors; especially suitable for oil burners, refrigerators, motor driven machinery and lighting loads.

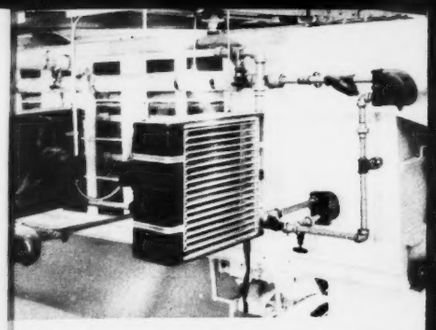
These switches have rugged, durable mechanisms built to perform with the sturdy integrity characteristic of Arrow-H & H Lines. Bakelite arc snuffers increase breaking capacity; kick-off release mechanically starts the switch blades in motion and prevents sticking; extra-heavy blades and contact jaws increase current-carrying capacity.

Different styles of mounting are supplied for a wide range of machine-design requirements. Separate switch units are available for installations in switch housings built into motor-driven machinery.

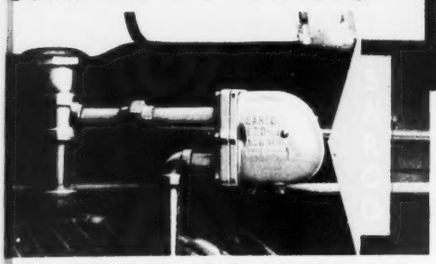
No. 6808 (upper right) is a double-pole switch for single phase motors; No. 7808 (lower left) is 3-pole for 3-phase jobs. Also, the line includes 3-way, 4-pole and 2-speed reversing switches. All have horsepower ratings... Everything you may need in this line will be found in Motor Starting Switch Catalog No. 7—on request.

THE ARROW-HART & HEGEMAN ELECTRIC CO.

HARTFORD, CONNECTICUT, U.S.A.



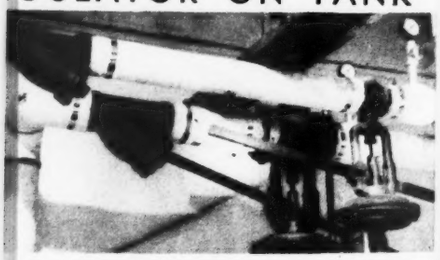
IIT HEATERS WITH
SARCO-FT TRAPS



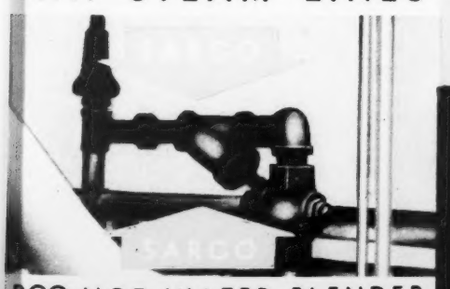
TO TRAP DRAINING
EADER TO BLAST COILS

YPE H TRAPS AND
ACKLESS VALVES

RCO TEMPERATURE
GULATOR ON TANK



RCO STRAINERS ON
AIN STEAM LINES



RCO HOT WATER BLENDER

SARCO

HEATING AND CONTROL SYSTEMS FOR INDUSTRY

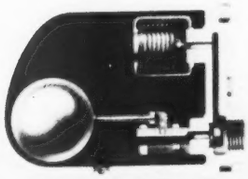
Every year shows a marked increase in industrial heating efficiencies with constantly reduced costs. In a few hours, and at small cost you can make your steam and hot water systems over, improve manufacturing conditions and save thousands of pounds of coal a year.

Begin with your heating: Install Sarco Traps that will make all radiation alive, effective, reliable and efficient. Check up on your return lines. Consider the possibility of Sarco Heat Control.

Then look into the hot water situation. With Sarco Blenders and Controls you probably would not find it necessary to increase tank capacities, pipe sizes, or coal consumption in order to bring your industrial, process and wash room hot water systems to maximum effectiveness ***and*** efficiency.

Sarco men make these problems look easy—inexpensive. They can come to you with a complete line of equipment, including the highest pressures in your plant.

Try one Sarco. Take the spot that is giving you the most trouble. Get a Sarco recommendation and try just one trap or regulator. Then find out what Sarco can do for your plant and make the simple changeovers as time permits.



SARCO FLOAT AND
THERMOSTATIC TRAP

Examine one Sarco thermostatic unit—see why it works where others fail—see how it is used in various forms in fifty different types and sizes of industrial traps and regulators for a hundred or more condensation, air removal and control problems.

0 TO 350 POUNDS

That's the Sarco line. And look how small, how easy to hook up and how well designed each unit is! It's partly because Sarco has been making industrial traps so many years; partly because they are made in a new plant devoted exclusively to this purpose, and partly because Sarco representatives have worked with operating engineers on so many problems and know exactly what is required.

ASK FOR THIS

New

DATA BOOK

Shows how to hook up all types of heating, air conditioning, and process equipment with suitable strainers, traps and controls. All sizes—all pressures.

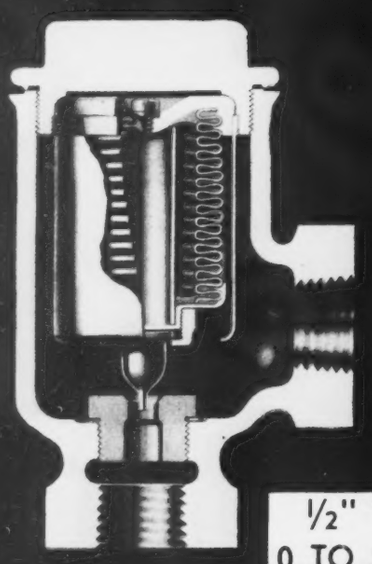
COMPLETE SYSTEMS FOR HEATING AND INDUSTRY

SARCO

REPRESENTATIVES IN ALL PRINCIPAL CITIES

THERMOSTATIC, FLOAT AND BUCKET TRAPS, REGULATORS AND HEATING SPECIALTIES

SARCO COMPANY, Inc., 183 MADISON AVENUE, NEW YORK, N. Y.



½" TO 2"
0 TO 200 LBS.

10 REASONS WHY SARCO No. 9

1. Thermostatic element ejects cooler condensate—more heat units used—less heat lost.
2. Wide open when cool. Removes air faster—heats up quicker.
3. One trap works satisfactorily at any pressure from 0 to 200 lbs.
4. Thermostatic element has heavy wall tubing with helical corrugations. Strain divided evenly over all convolutions.
5. Only one moving part. No toggles—no levers.
6. Self adjusting. No seats to change when pressures vary.
7. Small and easy to install.
8. Can be used anywhere, indoors or out.
9. Low cost makes individual trapping economical.
10. Backed by the company that introduced bellows thermostatic traps 25 years ago and the acknowledged pioneer in the industrial field.

The Sarco No. 9 high pressure thermostatic traps on this battery of hydraulic presses have operated satisfactorily ten million times! Until the first Sarco was installed no other trap had been found that could do the work. Now this company reports: "They save time, reduce rejects, work perfectly every day, and have for years".

This is not an exception and not an accident, for the thermostatic element and the unique Sarco Bellows have been steadily improved since first introduced a quarter of a century ago. Today **Sarco** furnishes satisfactory traps for the outstandingly difficult process applications in industry. Also, it is the only company able to furnish equipment in a complete range of types, sizes, and pressures for condensation removal and temperature control.

Read the reasons why at the left—get the Sarco representative to show you a cross-section sample—then try one on your most difficult job.

SARCO TEMPERATURE *Controls*

Wherever you have temperature operations, hot or cold, you risk your entire production cycle, and jeopardize your profit margins, if you depend upon the human element in temperature control. Stop these inefficiencies and all your needless heat losses with Sarco Temperature Control.

Here again—a type and size for every purpose—for steam, gas—oil—water—brine or freon, in temperatures ranging from 0 to 300°. Operated by the irresistible force of liquid pressure (no stuffing boxes), and with the special Sarco helically corrugated tubing, these regulators provide a security, long life, and economy not available in any other type of control.

SARCO COMPANY, Inc.
183 MADISON AVE., NEW YORK
Send information on:
Heating ☐ Process Temp. Control ☐
Process Steam ☐ Hot Water Control ☐
The New Data Book ☐

NAME.....
COMPANY.....
ADDRESS.....

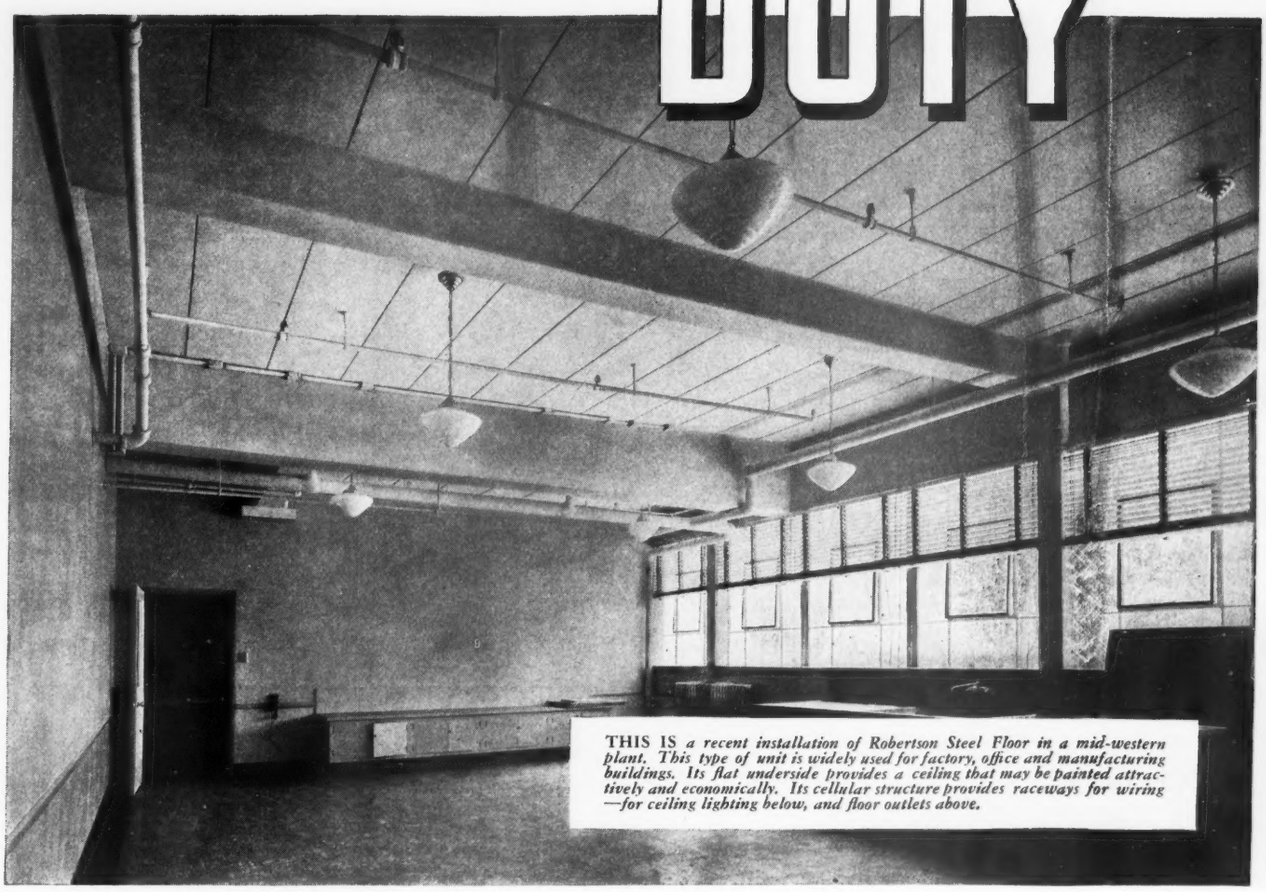
COMPLETE SYSTEMS FOR HEATING AND INDUSTRY

SARCO

REPRESENTATIVES IN ALL PRINCIPAL CITIES

THERMOSTATIC, FLOAT AND BUCKET TRAPS, REGULATORS AND HEATING SPECIALTIES
SARCO COMPANY, Inc., 183 MADISON AVENUE, NEW YORK, N. Y.

This Floor does DOUBLE DUTY



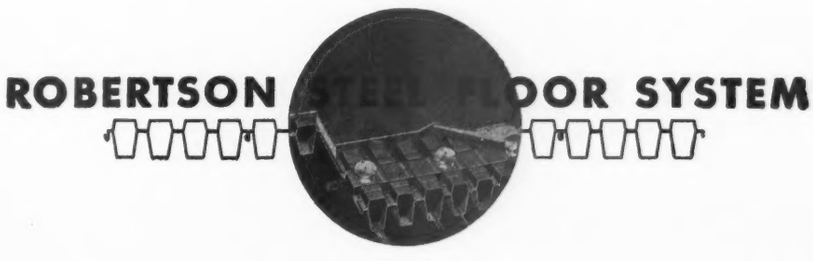
THIS IS *a recent installation of Robertson Steel Floor in a mid-western plant. This type of unit is widely used for factory, office and manufacturing buildings. Its flat underside provides a ceiling that may be painted attractively and economically. Its cellular structure provides raceways for wiring —for ceiling lighting below, and floor outlets above.*

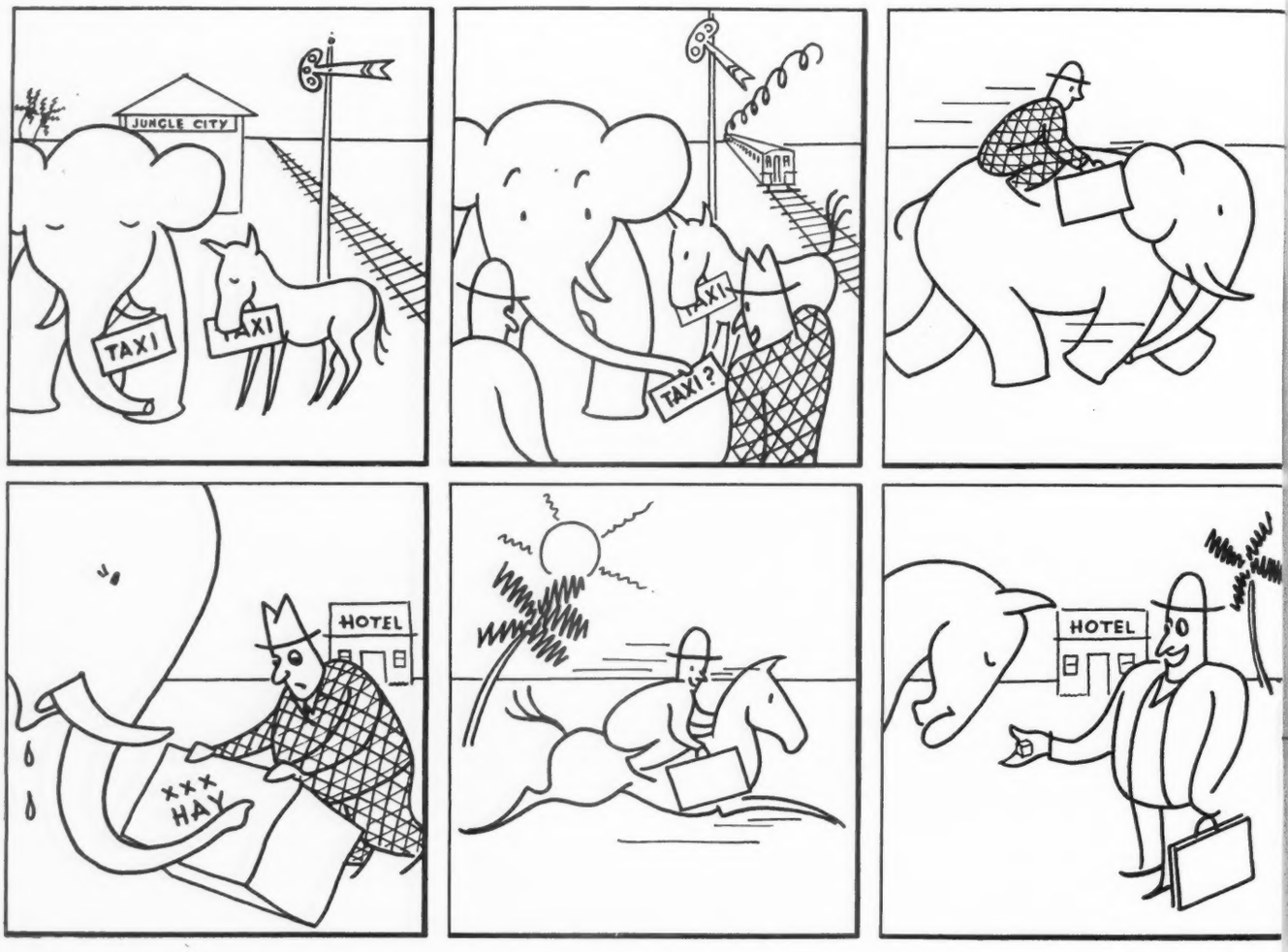
Gives advantages of Strong, Lightweight Steel Construction . . . may serve as Self-Contained Wiring System

THE Robertson Steel Floor is a construction that is compact and exceptionally strong. One that can carry far greater live loads than most floors. One that is fire-resistant. A floor that is easy to install, and forms a safe, solid platform upon which to work, immediately it is laid.

In addition to its structural advantages, the Robertson Floor may serve as a self-contained wiring system. The parallel hollow cells of which the Robertson Floor is composed may be used as roomy runways for the distribution of wiring. Your factory building—or any building—is assured of a longer, more useful life, electrically, when equipped with Robertson Floors. Outlets can be cut in anywhere—at any time—over the entire floor area. This means that old equipment may be moved, or new equipment installed, as needed, with a minimum of time, trouble and expense.

The complete story contained in our brochure "New Life For Buildings," will acquaint you with the many revolutionary advantages that this double duty floor offers. Write for it and our special technical catalogue. H. H. Robertson Co., 2005 Grant Building, Pittsburgh, Pa.





ELEPHANT POWER is expensive

when small horsepower will do the job

When ordering steam turbines for jobs below 150 H.P., remember that Coppus builds 6 sizes down to fractional — with prices in proportion.

Coppus helps you save on investment, installation, depreciation and maintenance. They are the lowest-priced high-quality steam turbines on the market — yet the same engineering skill goes into their manufacture that Coppus puts into its larger-sized units. Built in speed reducers. Individual nozzle control. Write for Bulletin 135-8.

COPPUS BUILDS STEAM TURBINES
FROM FRACTIONAL TO 150 H.P.

COPPUS

When your problem is AIR . . .

consider what Coppus has done to put air into better shape for men and machines. If you want air cleaned, cooled, moved, or exhausted, there's a Coppus product to do the job, and a size to fit your requirements.

Coppus Engine Filters keep abrasive dust out of compressors and engines.

Coppus Unit Filters improve working conditions, protect product purity.

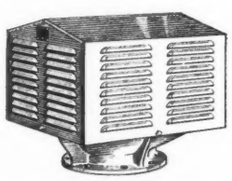
Coppus Heat Killers supply a refreshing breeze to workers on hot jobs.

Coppus Manhole Ventilators remove noxious gases from confined spaces.

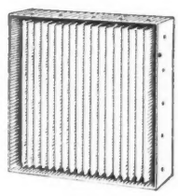
Coppus Blowers rapidly cool and ventilate tanks, boilers, etc.

Coppus Forced Draft Blowers double boiler capacity, cut fuel costs.

They Make Air Behave!



COPPUS ENGINE FILTER (for intakes) 95.6% efficient against 2 micron-size silica dust — highly abrasive. Wide pocket areas — no clogging. Pulsation of air flow makes it virtually self-cleaning. Steel construction — no wires — vibration-proof. Minimum of welds.

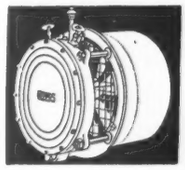


COPPUS UNIT FILTER. Dry-type — no oil to fill with dirt and require constant cleaning. Helps keep equipment clean, recover valuable substances, prevent contamination, etc. Bulletin F-320-5.

COPPUS HEAT KILLER. It directs a flow of invigorating cool air onto the job — without recirculating stale air. Portable. Can be used for cooling off furnaces, drying, etc. Bulletin F-310-3.

COPPUS CABLE MANHOLE VENTILATOR, Cuts down the time workmen have to wait for air that's safe to work in. High outlet velocity — no duct. Low-cost operation — large volume of air for small diameter and small H.P. Bulletin 163.

COPPUS MANHOLE BLOWER. Here's the same fan attached to a special manhead for cooling and ventilating of boilers, tanks, retorts, etc. Easily handled by one man. Bulletin 161-3.



COPPUS FORCED DRAFT BLOWER. It allows the burning of any low-priced fuel or waste material — saving more than the blower costs. Doubles draft efficiency. No change in chimney required. Bulletin 145-4.

Also: Shiphold Ventilators, Tank Car Ventilators, Hot Gas Fans, Blowers for Mine Ventilation.

FRESH AIR FOR MEN AND MACHINES COPPUS

COPPUS ENGINEERING CORPORATION, 375 Park Avenue, Worcester, Mass.

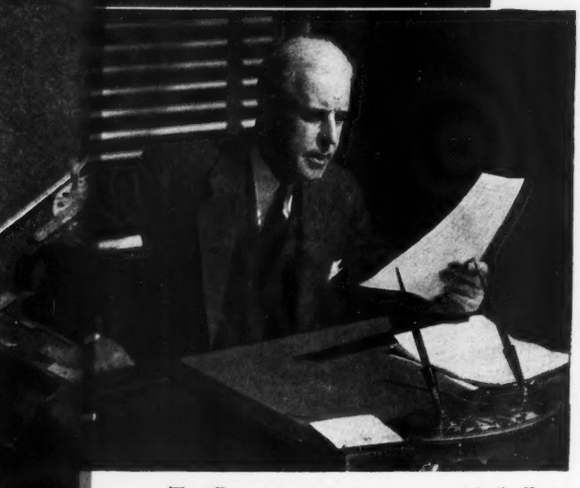
Branches and representatives in principal cities — listed in THOMAS' REGISTER. See catalog page in SWEET'S

LOWER POWER

TEXACO
REG. T. M.

TEXACO

BILLS ...*Immediately!*



To offset rising power costs, get rid of all unnecessary friction. This requires lubricants that stay in the bearings, that withstand the heat and speeds of present-day machines. Texaco has the answer to these problems, because Texaco Lubricants are specifically designed to meet today's needs.

YOU WOULD PAY LESS for power, if you could eliminate unnecessary friction *throughout* your plant.

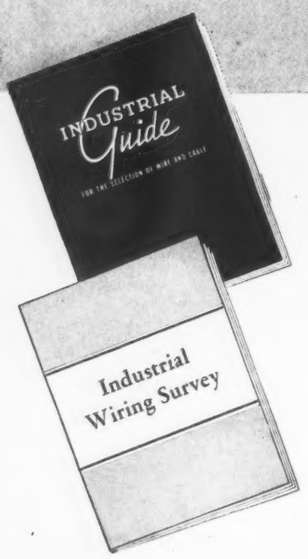
A Texaco Lubrication Engineer can help your men do this. Experience in many plants like yours has made him familiar with your operation. More important, he knows where to look for possible snags.

He has another advantage, too. There are more than 350 Texaco Products from which he can select the one best suited to your needs. Each of them was developed in answer to some lubricating problem . . . each to meet the specific requirements of management looking for better operation.

Trained lubrication engineers are always available for consultation on the selection and application of Texaco Industrial Lubricants. Prompt deliveries assured through 2070 warehouse plants throughout the U. S. The Texas Company, 135 East 42nd St., New York City.

Industrial Lubricants

DO YOUR ELECTRIC CIRCUITS "HORSE DRAWN"?



How to find what's wrong with your project's electric circuits

Our "Industrial Wiring Survey" tells you how to initiate a scientific check-up of electrical circuits. It simplifies the problem surprisingly.

Our "Industrial Guide for the Selection of Wire and Cable" tells how to correct the trouble.

Brand new, it is the only thing of its kind in the electrical industry. Scores of situations are described and an engineering recommendation is given for the correct wiring solution of each. These books are free. Send for your copies.

ANACONDA
from mine to consumer

Anaconda

General Offices: 25 Broadway, New York

DATE FROM THE DAYS?

Perhaps not... yet chances are they're antiquated enough so that power is being wasted every hour of the day. New, improved cables will save money... repay their cost many times over. Let us tell you how to make a check-up without cost!

YOU can see a leaky water pipe. But you can't always detect an electric circuit that is wasting power. And the tragedy is that *most* industrial circuits are wasting current needlessly. Estimates show that *in 9 out of 10 industrial plants, important savings could be made by bringing antiquated, outworn circuits up to date!*

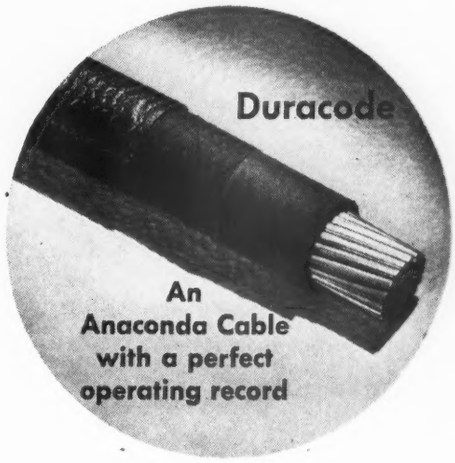
Sometimes, deficient circuits reveal themselves in breakdowns. Men and machines stand idle. Products in process spoil. Dollars fly out the window every hour until repairs are completed.

More often, the losses aren't so easily detected. Perilous overloads cause heat losses. Power "evaporates" invisibly. Maintenance and repair bills are considerably higher than they should be.

Safeguard your project

Do something today to safeguard your project against these dangers. Have a check-up of electric circuits made. Learn about the improved types of cable and the economies they make possible.

The two books shown at the left give you everything you need for a study of your electric wiring. New, informative, they are being used by hundreds of manufacturers. Send for them today. If you have a specific problem in mind, consult our Engineering Department. We will be pleased to cooperate without obligation.



Here is an Anaconda cable that has a remarkable record of continuous performance without a single reported failure. Millions of feet of *Duracode* are in underground use by utilities.

• • •

The outstanding characteristics of this Anaconda cable are: 1. Its remarkable stability. This has been demonstrated by accelerated aging and other tests as well as by use in the field. 2. The compound is highly resistant to moisture, acids, and alkalies. 3. Low susceptibility to combustion and explosion. 4. Its heat-resisting characteristics permit large emergency overloads.

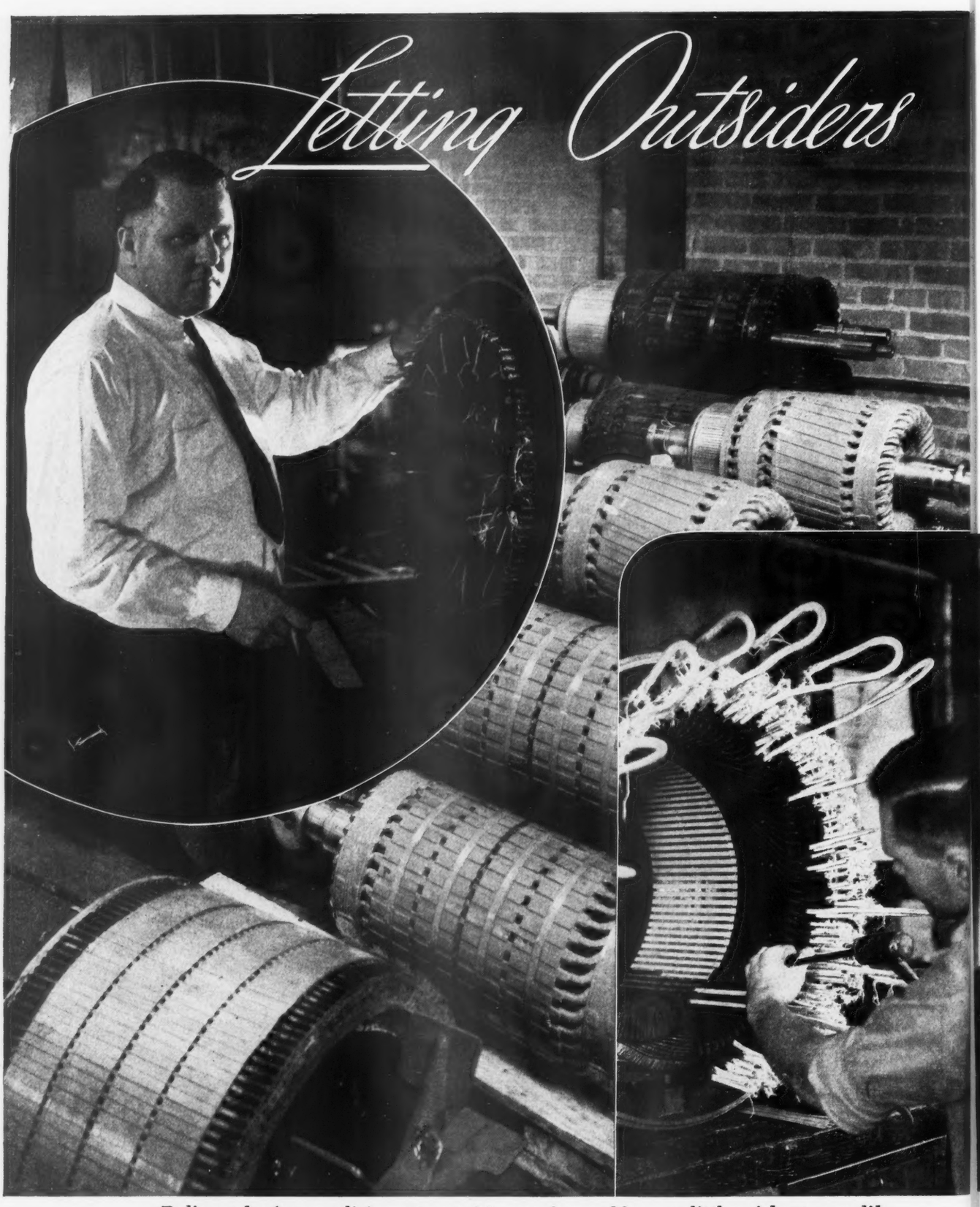
• • •

It pays not only to install adequate wiring but to use *modern, improved* types of cable like this one. Make sure that you are getting the benefit of the tremendous strides in cable manufacture. Specify Anaconda... where standards are being improved constantly. 37542-A

Write for data on DURACODE

Wire & Cable Company

Chicago Office: 20 North Wacker Drive • *Sales Offices in Principal Cities*



Reliance business policies expressed in words would mean little without men like Bert Clough in the plant to make them alive. Associates and customers alike will testify that during Bert's 26 years at Reliance he has been known as an exponent of good workmanship and ready day and night to do his part in emergencies.

on the *Inside!*

Many of the visitors that Reliance salesmen bring to our Winding Department know a whale of a lot about motors. They have good eyes and can ask plenty of questions. I wouldn't want them around if we weren't doing a good job. They like to know about the material we use, where we put it, how much we use, etc. We are glad to show them because we are sure that we rate high on this score. « « « Another thing we are always anxious to show is the thoroughness of our insulation work, such as applying materials and impregnating in varnish and baking. « « « We like to have visitors, too, because we do so much particular work that's not apparent on the surface. The way you really find out how expertly this is done is to put the motor to work and see how well it sticks on the job. That's why we check up on ourselves regularly by following motors in unusual service. We often learn a great deal in the user's plant that helps us do things still better here.

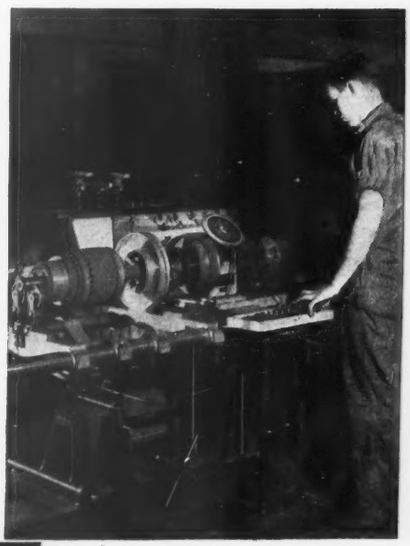
Bert E. Clough

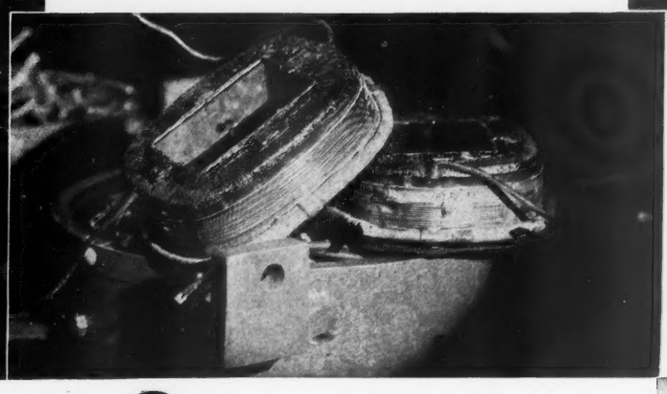
Foreman of Winding Department,
RELIANCE ELECTRIC & ENGINEERING CO.

Left—Duraseal Insulation, a 4-time protection, is an example of what we mean by thoroughness. Stators with semi-enclosed slots go into the varnish tanks three times and get a 12-hour baking after each application. The final step is a spray-coat of orange-colored enamel. All this means longer life where there's dirt, moisture, oil, and so on.

★ ★ ★

Right – New uses and new methods of application have brought more and more exacting demands for quiet operation and improved running balance of electric motors. This Olsen-Lundgren Balancing Machine is used for balancing Reliance armatures and rotors. It indicates needed corrections so accurately that any special demands for smoothly running motors can be readily met.

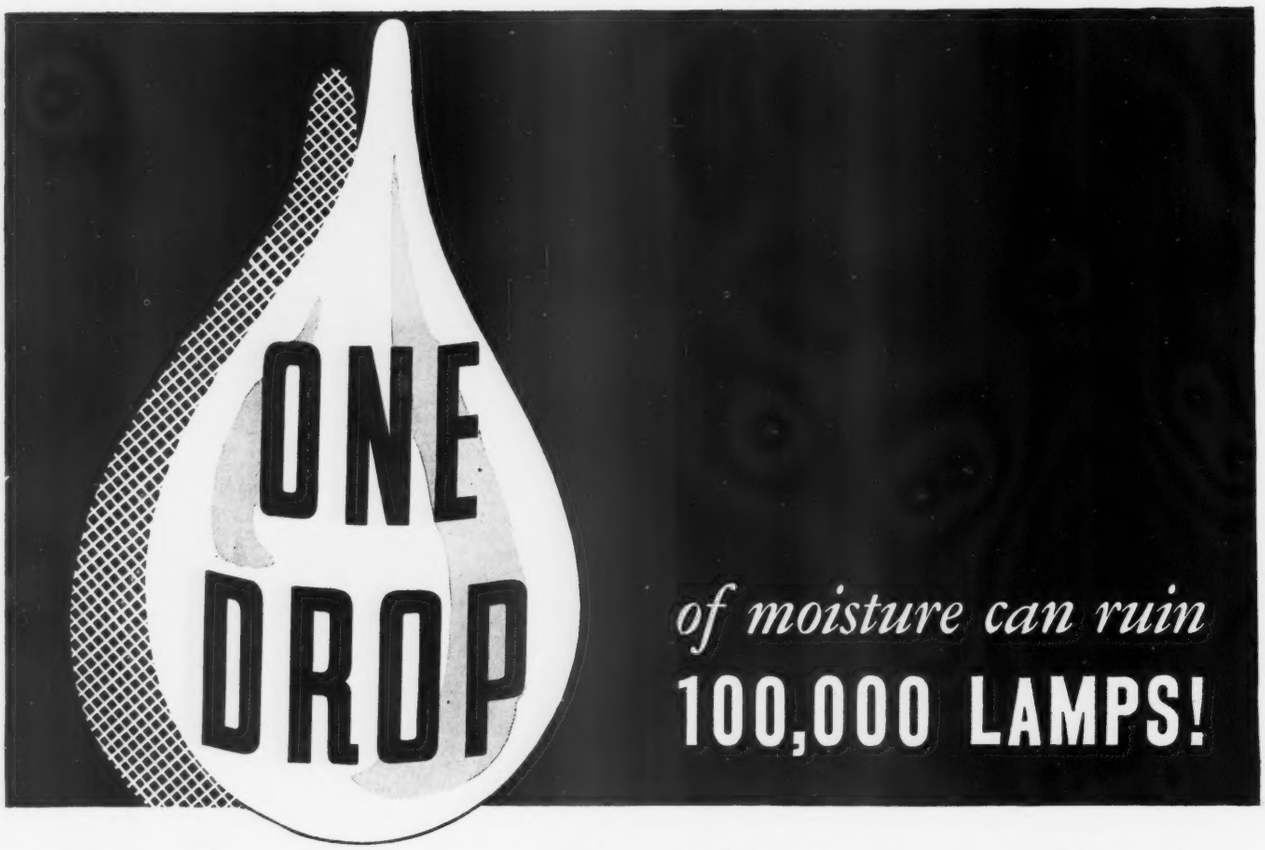




Left – Constant improvement in field coils for d-c. Type "T" Reliance Motors has come about through the helpful cooperation of users. The bobbin-type construction shown here makes a substantial coil unit with excellent mechanical protection and ample insulation at all points. These coils receive four varnish treatments each followed by baking with a spray-coat of enamel after assembly in the frame.

RELIANCE A-C D-C MOTORS

Reliance Electric & Engineering Co.
1088 Ivanhoe Road, Cleveland, Ohio
Branches: Birmingham, Boston, Buffalo, Chicago, Cincinnati, Detroit, Greenville (S.C.), NewYork, Philadelphia, Pittsburgh
Representatives in other principal cities



Exacting care in making Westinghouse Mazda Lamps . . . means MORE LIGHT—LONGER

It takes only 1/100,000 of a drop of water inside a lamp to blacken it—a single drop can cut the efficiency of one hundred thousand lamps! No wonder, then, that Westinghouse takes unusual precautions to guard against moisture—the gas pumped into every bulb is processed to remove every trace of it, and the glass bulb itself is heat-treated to drive out whatever small amount of moisture there might be on its surface.

These elaborate precautions—and hundreds of others—make Westinghouse Mazda Lamps the most economical sources of electric light you can buy—because they give you more light—longer.

Over 480 tests and inspections of materials and processes go into the making of every Westinghouse Mazda Lamp. If any one of these tests or inspections were omitted, the quality of the lamp might be impaired. When you see the Westinghouse trade-mark on a Mazda lamp, you know that it is the best lamp science and engineering skill can make.

HOW TO JUDGE A LAMP

Lamps differ in quality. Inefficient lamps waste current and increase the cost of light. Our free booklet, *"How to Judge a Lamp"*, tells the important points to consider when buying lamps. Send for it today. Westinghouse Lamp Div., Westinghouse Elec. & Mfg. Co., 150 Broadway, New York, N. Y.

Westinghouse makes no compromise with quality

Westinghouse MAZDA LAMPS

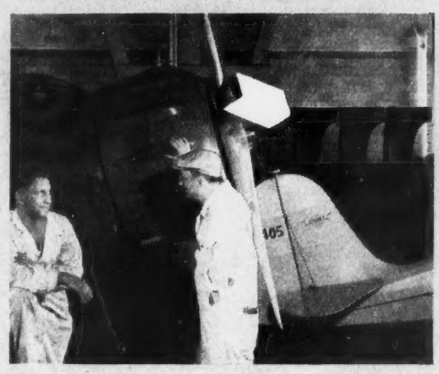
COLD WAVE GRIPS NATION

Will your heating equipment keep production going this winter?

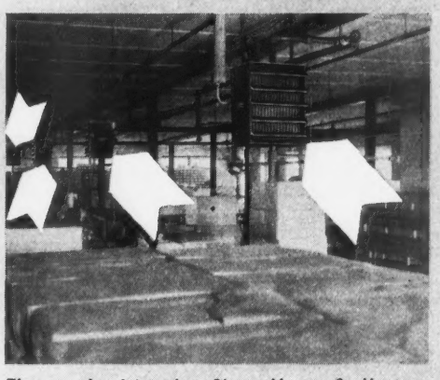
Those sub-zero days strike with a bang, tying up traffic and putting heating equipment under a terrific load. Once winter sets in, heating repairs are more difficult to make and may cause costly delays.

Don't let winter catch you with a full production schedule and poor or ineffective heating equipment. It is cheaper to let your heating contractor check the heating equipment in your plant now.

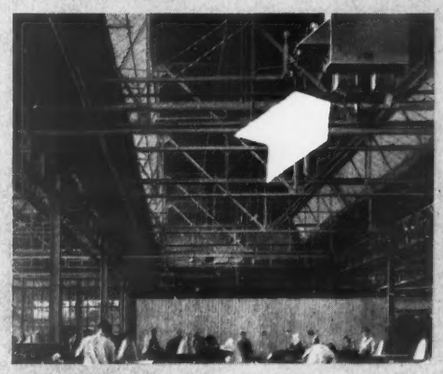
Men can't work effectively in cold plants no matter how hard they try. Production slumps off—efficiency goes down—time is lost. Get efficient heating equipment now. Buy American Blower Units.



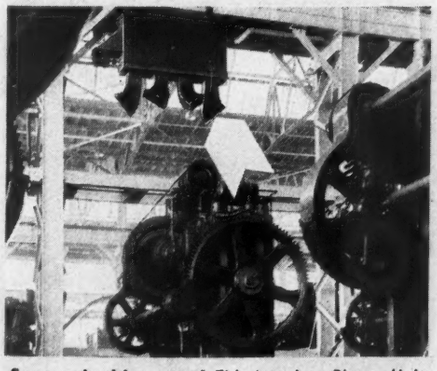
Airport heating has to be efficient. That's why so many of the airports are equipped with American Blower Sirocco Unit Heaters. Those big, powerful units heat large areas easily, and at lower costs, too.



Thousands of American Blower Venturafin Heaters are performing their tasks effectively and economically in printing shops, garages, industrial plants, warehouses, service stations, restaurants, markets, etc.

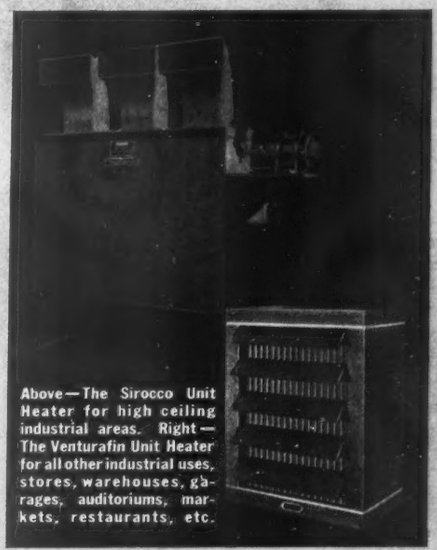


The bigger the plant the bigger the heating problem. Good Unit Heaters are the best insurance against cold delays. Temperatures may be automatically controlled and maintained.



Save valuable space! This American Blower Unit Heater suspended from the girders overhead forces heat into working areas, cuts heating costs, saves space and prevents damage to heating equipment.

A. G. Turner, production manager, says—"American Blower Unit Heaters have cut our costs considerably. We have tried other makes but American Blower Units work better and last longer."



Above—The Sirocco Unit Heater for high ceiling industrial areas. Right—The Venturafin Unit Heater for all other industrial uses, stores, warehouses, garages, auditoriums, markets, restaurants, etc.

American Blower Unit Heaters cost no more than ordinary units. They are carried in stock in all principal cities and may be purchased on long, easy terms through the Heating and Plumbing Finance Corporation. No down payment—3 years to pay. Ask your heating contractor for complete data.

AMERICAN BLOWER

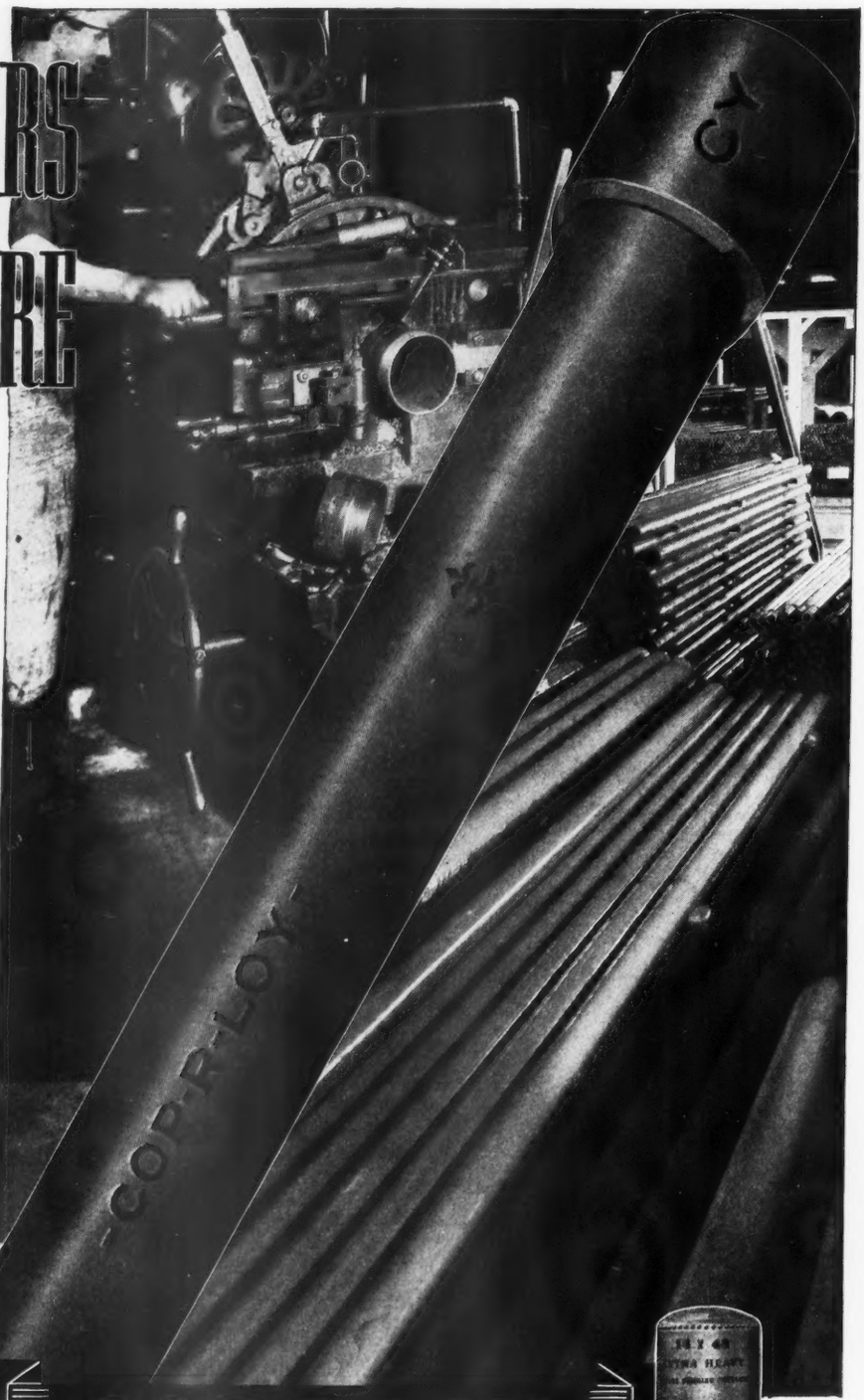
INDUSTRIAL UNIT HEATERS

AMERICAN BLOWER CORP., DETROIT, MICH. • Division of American Radiator and Standard Sanitary Corp. • Canadian Sirocco Co., Ltd., Windsor, Ont.

DISTRIBUTORS EVERYWHERE

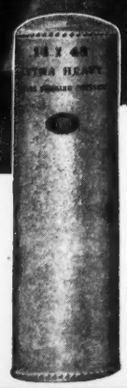
at your service

When COP-R-LOY pioneered the first pipe made of copper alloyed steel it set up a new standard in quality and durability. It did more than that—it established a new economy in service costs for both the plumber and the owner. That was nine years ago . . . and, today, the wide acceptance of COP-R-LOY is reflected in the fact that leading distributors carry full stocks of tubular goods made of COP-R-LOY (black and galvanized) in all standard sizes. For whatever project you have in hand, specify genuine Wheeling COP-R-LOY by name—It's Wheeling Steel. Wheeling Steel Corporation, Wheeling, West Va.



WHEELING STEEL

COP-R-LOY
Reg. U. S. Pat. Off.



All sizes and types of Whitaker Range Boilers and Special Tanks are obtainable through your regular source of supply. Made of COP-R-LOY and sold only through recognized jobbers of plumbing and heating supplies.

IT'S WHEELING STEEL

CHECKING 2000 ORDERS DAILY TO MEET CUSTOMERS' REQUIREMENTS

How McCaskey Production Control enables Tuttle & Bailey, Inc., New Britain, Conn., to schedule and check their 2000 production orders at various control points several times daily, outlined by Mr. G. E. Herre, Production Manager:

"Supplying registers, grilles, and air controlling devices to the rapidly expanding air conditioning industry may require the shipment of stock material for some simple requirement or the fabrication of special material for some highly complicated, individually engineered project.

"An inventory of more than 10,000 different items of finished and semi-finished parts must be kept at proper levels and approximately 2000 orders for contract and stock goods scheduled and checked at various control points several times daily to make possible the service our customers demand.

"McCaskey Production Control provides us with instant visible records showing the location at any time of all the items being fabricated on our production lines. This information is secured with minimum clerical effort and is available at our central production control in the main office for all production purposes. It enables our expediters to handle several times the amount of delivery correspondence possible with previous methods.

"McCaskey move tickets give each factory department head a record, not only of the work done, but also of future requirements for fabrication in his department, prior to actual delivery. Movement of orders is thus speeded up between departments, and the necessity for auxiliary identification tags is eliminated.

"The cost of the McCaskey System is insignificant in comparison with the results obtained."

Whatever your products or the size of your plant, McCaskey Control methods may be adapted to your specific requirements with equally gratifying results. Write us for a copy of "Production Control Simplified" or pamphlets on other McCaskey Industrial Controls.

THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

PULLING TOGETHER—

to Deliver Full

the MATCHED QUALITY of DODGE "D-V" Drives Prevents "Power Waste"

Like a perfectly picked crew — Dodge "D-V" Drives have that perfectly matched quality which insures efficiency. Both sheave and belt function in perfect harmony — transmitting full power continuously and insuring against costly power loss. In design, quality of materials, and construction, Dodge "D-V" Drives are quality products . . . Dodge sheaves are accurately built of close-grained iron, insuring smooth grooves, with no rough spots to fray belts. Dodge "D-V" Belts are long-lived—with concave side walls so that, when flexing over the sheave, the sides form a perfectly straight surface in contact with the grooves. The belt cannot turn or shift as the "strength" section of cords is in the exact center of the belt.

There's a Dodge "D-V" Drive for every service — a drive of perfectly *matched quality*. And throughout the entire line of Dodge Power Transmission Equipment there are refinements of design and operating efficiency which reduce power waste and insure steadier, more continuous production flows. Let Dodge Engineers assist in working out your own power transmission modernization.

DODGE MANUFACTURING CORPORATION
MISHAWAKA INDIANA, U. S. A.

DODGE
MISHAWAKA

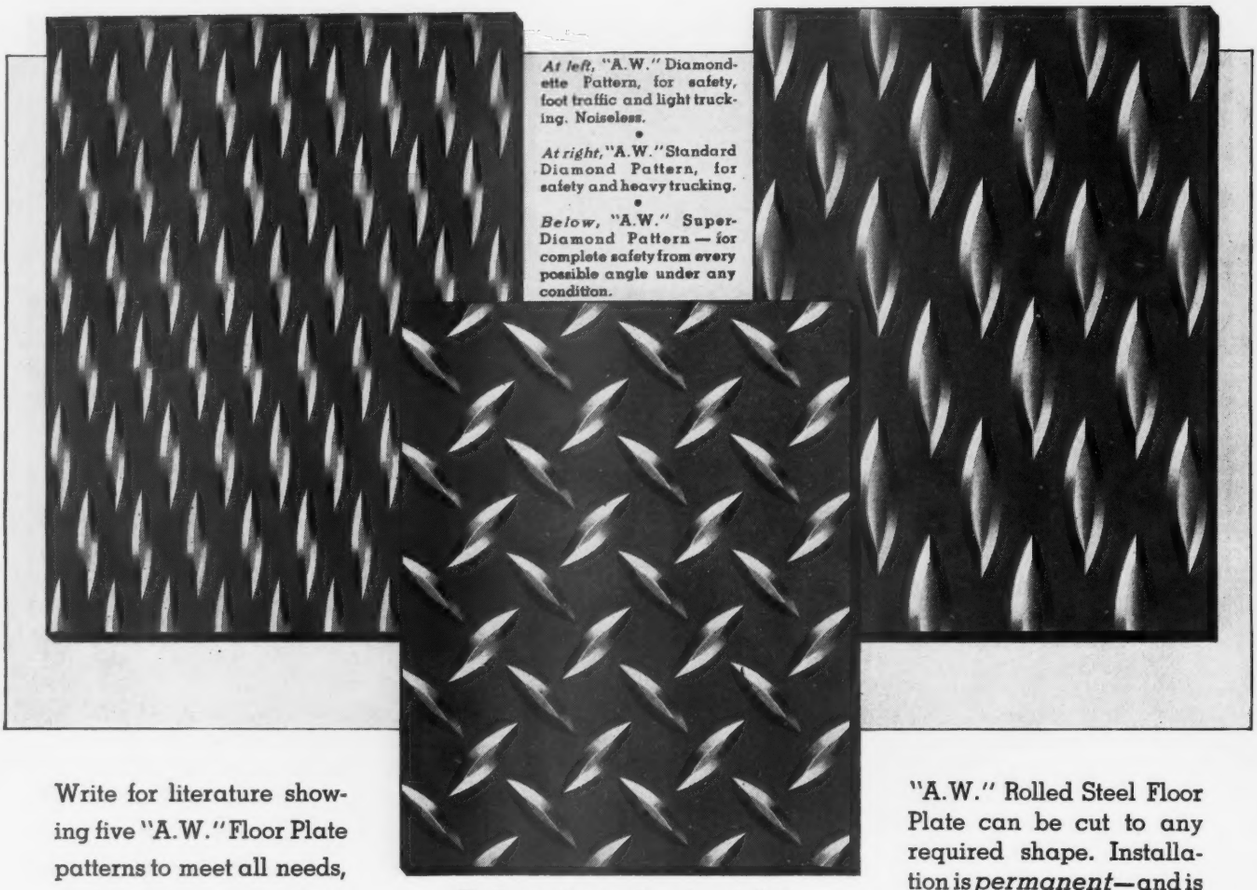
Bulletin A-209 is now available and gives engineering information insuring proper selection of "D-V" Drives for every service. A copy will be sent on request.

There Is Added Value

In the Name Dodge!

THESE PATTERNS ARE ENGINEERED FOR SAFETY

—but any "A.W." Rolled Steel Floor Plate also gives you the most economical floor covering, and the most efficient. Its first cost is low, and there is no maintenance cost. It drains quickly, is easily cleaned. It is oil proof, crack proof, heat proof.



At left, "A.W." Diamondette Pattern, for safety, foot traffic and light trucking. Noiseless.

•

At right, "A.W." Standard Diamond Pattern, for safety and heavy trucking.

•

Below, "A.W." Super-Diamond Pattern — for complete safety from every possible angle under any condition.

The three patterns are here shown half-size

Write for literature showing five "A.W." Floor Plate patterns to meet all needs, and giving complete engineering data.

"A.W." Rolled Steel Floor Plate can be cut to any required shape. Installation is *permanent*—and is made quickly, without disturbing men or production.

ALAN WOOD STEEL CO.

ALAN WOOD STEEL CO. ESTABLISHED "A.W." TRADE MARK 1826 CONSHOHOCKEN, PA.

CONSHOHOCKEN, PA.

Branches: Philadelphia, New York, Boston, Detroit, Los Angeles, San Francisco, Seattle, Houston

111 YEARS' IRON AND STEEL MAKING EXPERIENCE

"Did you say unit heaters?"

"No, I said MODINES"

● All unit heaters are not Modines. But, there are more Modines being sold than any other make. Modine users are the most satisfied unit heater users in America. For Modines give them exclusive advantages that simply do not exist in other unit heaters.

Superior heating performance, that's to be expected of Modines. Greater fuel savings, naturally. Lower installation costs, of course. Proved by thousands of industrial and commercial applications. The result of Modine advanced design and exclusive Modine construction features. Let's look at Modine *from the inside* . . . will you turn the page?

TO GET THIS FREE BOOK

FILL IN THE COUPON . . . DETACH AND MAIL TO MODINE MANUFACTURING COMPANY, 1730 RACINE ST., RACINE, WIS.

This book tells how Modine better heating steps up production, improves working conditions in factories; assures customer and employee comfort in stores . . . saves 13½ to 25% and more in fuel costs alone. Complete construction, operation and application details. Mailed without cost or obligation.

Individual.....

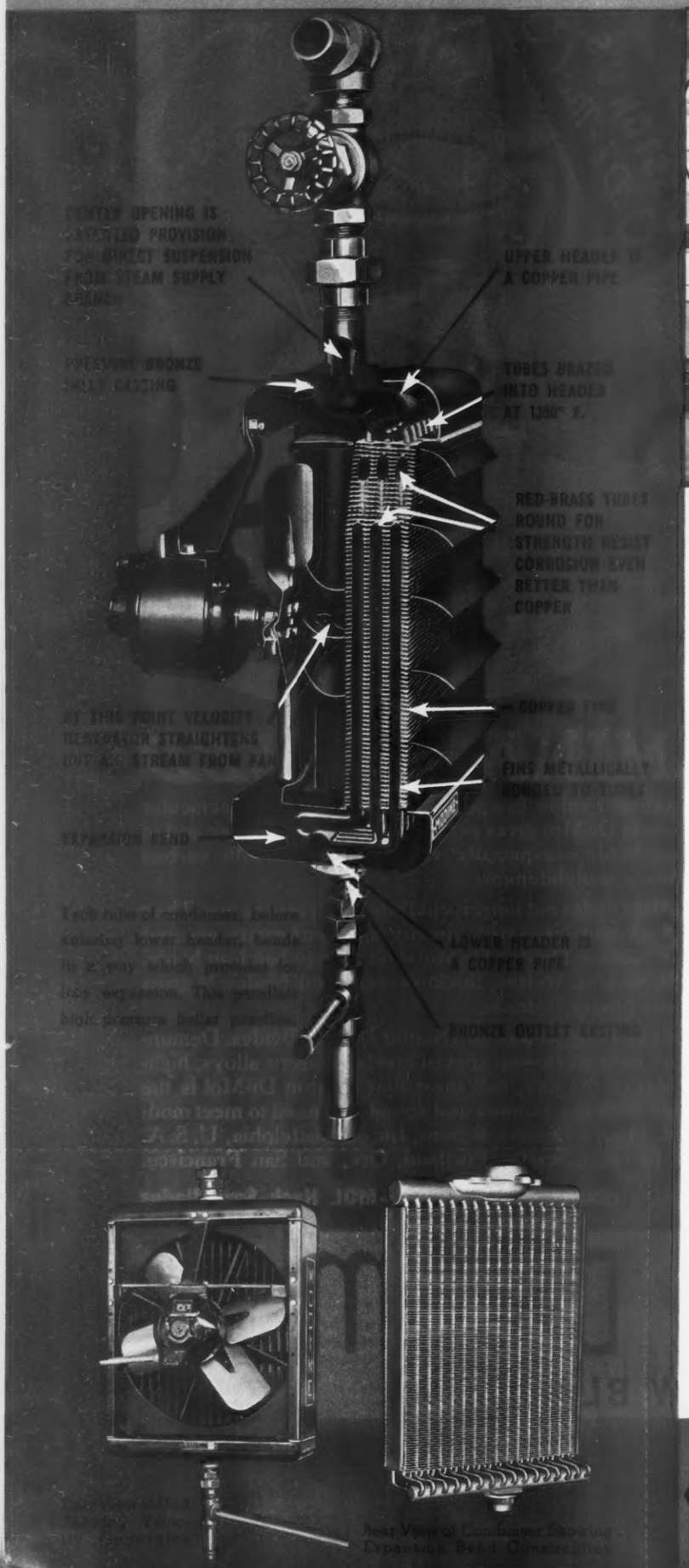
Firm.....

Street and Number.....

City..... **State**.....

and on the next page . . . gentlemen ➟

You get more from MODINE *than any other Unit Heater*


CENTER OPENING IS ADAPTED PROVISION FOR DIRECT SUSPENSION FROM STEAM SUPPLY
UPPER HEADER IS A COPPER PIPE
PRESSURE BRONZE CAST CASTING
TUBES BRAZED INTO HEADER AT 1350° F.
RED-BRASS TUBES ROUND FOR STRENGTH RESIST CORROSION EVEN BETTER THAN COPPER
COPPER FINS
AT THIS POINT VELOCITY GENERATOR STRAIGHTENS OUT AIR STREAM FROM FAN
FINS METALLICALLY BONDED TO TUBES
EXPANSION BEND
LOWER HEADER IS A COPPER PIPE
BRONZE OUTLET CASTING
Rear View of Condenser Showing Expansion Bend Construction

● **The suspended type unit heater was pioneered by Modine. No other unit heater manufacturer has gone so far with advanced design and greater structural strength.**

Inlet to outlet, the Modine condenser is *all copper and copper alloy*. All steam-carrying passages are *cylindrical* for excess strength—and cannot leak under high pressures or temperatures. Every condenser tube can *individually* contract or expand with knee-joint movement—the now famous *expansion bend* recently developed by Modine and not to be found in other unit heaters.

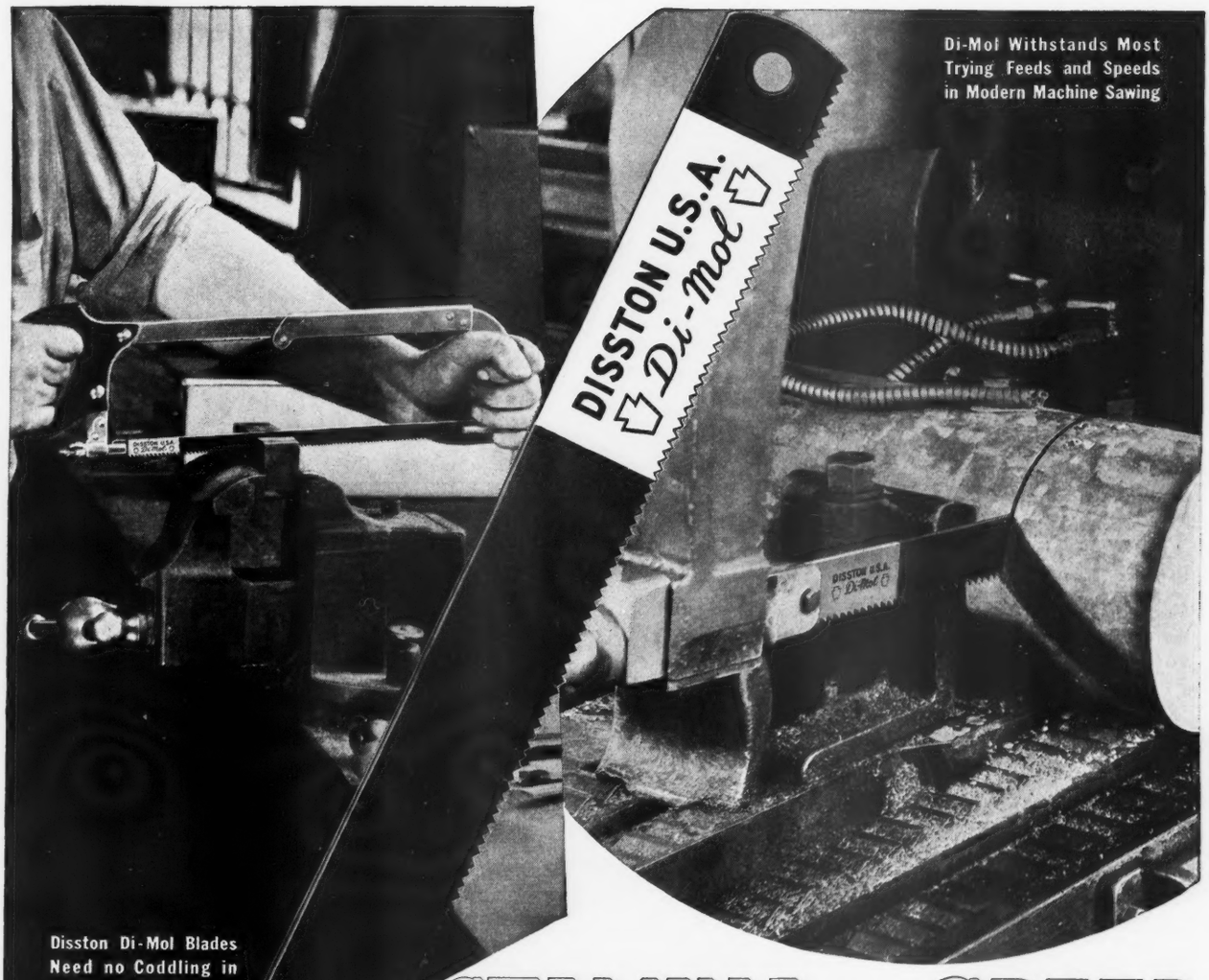
Metallic bonding prevents the possibility of reduction of heat transfer from tubes to fins.

Modines give a greater "heat throw" without increased power requirements because of the *velocity generators*, exclusive with Modine.

Suspended directly from the steam line, without brackets, rods or straps...a Modine *patented* feature...Modines cost less to install.

When you get so much more from Modines, why compromise on anything less. Don't accept any substitute in unit heaters . . . *insist on Modines.*

FOR COPY OF FREE BOO
Fill Out Other Side, Detach and Ma


DISSTON U.S.A.
Di-Mol
Di-Mol Withstands Most Trying Feeds and Speeds in Modern Machine Sawing
Disston Di-Mol Blades Need no Coddling in the Hands of Shop Men
The Hack-Saw Blade Backed by Nearly a Century's Experience in Making Saws

STAMINA AND SPEED

New and sensational value, in a general purpose blade! Spectacular in results! Disston Di-Mol gives amazing economy in blades and in production per blade,— especially when compared with carbon blades or ordinary molybdenum.

Disston Di-Mol Blades cut longer, cut faster, cost less to use. They are Disston workmanship—with quality and uniformity assured by the Disston name—Disston Di-Mol—on orange band on blade. Standard teeth, lengths, widths, thicknesses. Hand blades, ½ gross in box. Machine blades, 1 dozen.

Order from your Distributor of Disston Di-Mol Blades. Demonstration in your own work—on special steels, modern alloys, high-test iron castings or the like, will show that Disston Di-Mol is the hack-saw blade with the stamina and speed you need to meet modern conditions. Henry Disston & Sons, Inc., Philadelphia, U. S. A. Also Detroit, Chicago, Seattle, Portland, Ore. and San Francisco.

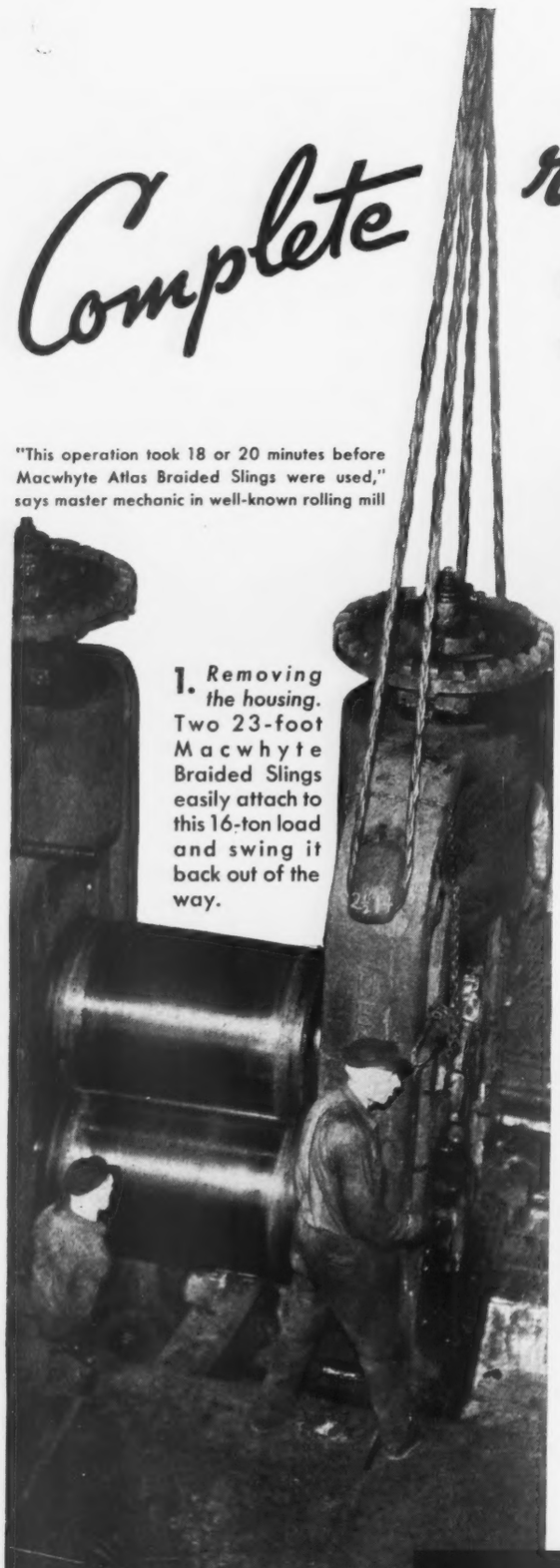
FOR DEMONSTRATION, Write your Distributor of Disston DI-MOL Hack-Saw Blades

DISSTON DI-MOL
HACK SAW BLADES

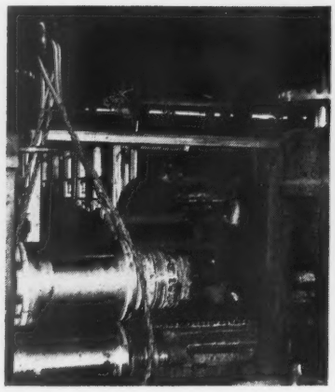
Complete roll change

made in 4 minutes, 31 seconds with two MACWHYTE ATLAS BRAIDED SLINGS

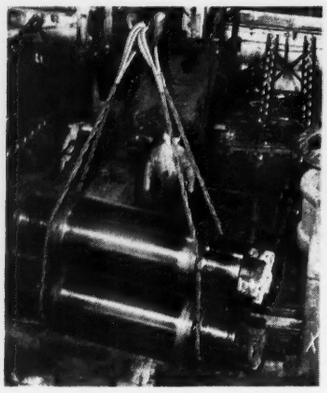
"This operation took 18 or 20 minutes before Macwhyte Atlas Braided Slings were used," says master mechanic in well-known rolling mill



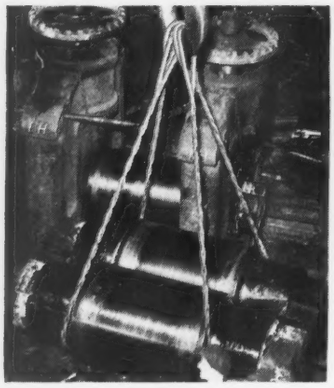
1. *Removing the housing.* Two 23-foot Macwhyte Braided Slings easily attach to this 16-ton load and swing it back out of the way.



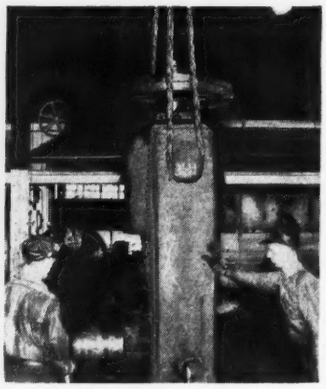
2. *Removing the rolls.* Same flexible braided slings are now attached to the rolls. Each roll weighs 10 tons.



3. *Up they go!* Note that both rolls are being lifted out at same time, one on top of the other. This helps cut changing time.



4. *Down to the floor.* Enough sling tension is kept to permit rolls to change position in sling cradle and lay side by side.



5. *Change is completed.* New rolls are picked up one at a time and placed in position. Housing is then replaced.

MACWHYTE COMPANY • Kenosha, Wisconsin • Manufacturers of Wire Rope and Braided Wire Rope Slings . . . Distributors throughout the U. S. A.

More Flexible . . . Easier to Handle . . . Safer

This special braided construction is what gives Macwhyte Atlas Slings their remarkable flexibility. They are light in weight, easy to handle, and resist kinking. Two slings used above are braided of 8 parts of 7/16-inch wire rope. Available in many other constructions, with any type of fitting, to speed materials handling in plants everywhere.

MACWHYTE WIRE ROPE
BRAIDED WIRE ROPE SLINGS

IN QUARANTINE *for You—*

NO immigrants anywhere ever get a more searching examination than do the materials ordered for Crane valves and fittings.

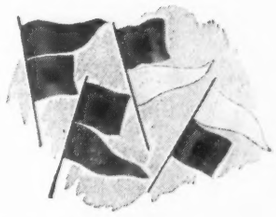
Though bought from the most reliable sources according to rigidly tested specifications, every shipment of material goes into "quarantine" at the Crane plants. There it stays until thoroughly tested in Crane laboratories.

This careful testing means that Crane is absolutely certain that materials are right before manufacture begins. It is only part of the elaborate system of tests and checks of tests throughout every Crane plant.

For after raw materials have been made into castings, the castings are checked and tested at every step through the various sub-assemblies, every part of a Crane product is tested, dimensions gauged and inspected. Finally, the finished valve or fitting is inspected as a whole before it leaves the plant.

There are over 33,000 gauges used in making certain that the dimensions of Crane valves and fittings are absolutely accurate. There is an army of inspectors whose only duty is to see that every Crane product is right in every part. Back of all this effort are the largest laboratories in the industry devoted to seeing that present products are properly made as well as working on new products for the future.

STORM WARNINGS FOR PLANT MANAGERS



NEW YORK, N. Y., Sept. 27—Maintenance costs are likely to be high when winter storms hinder repair work on pipe lines. It's much cheaper to go over your lines while good weather lasts. Replace leaky valves, weakened fittings and pipe with CranEquipment.

Then you can head into the winter season with the assurance that you have given your piping lines the best help which you can buy.

You will find what you need in piping in your Crane No. 52 Catalog. Consult it whenever you want valves, fittings or piping. But hurry. The frost won't wait for anyone—and maintenance work can be done so much more cheaply and easily before the cold sets in.

Visit the Crane exhibit at the Chicago Exposition of Power and Mechanical Engineering—Booths 1 and 2—New International Amphitheatre, Chicago, October 4 to 9.

CRANE

CRANE CO., GENERAL OFFICES: 836 S. MICHIGAN AVE., CHICAGO, ILLINOIS

Branches and Sales Offices in One Hundred and Sixty Cities

VALVES, FITTINGS, FABRICATED PIPE, PUMPS, PLUMBING AND HEATING MATERIAL

MODERNIZE...

INCLUDE *Frigidaire* WATER COOLING EQUIPMENT IN YOUR BUDGET FOR 1938

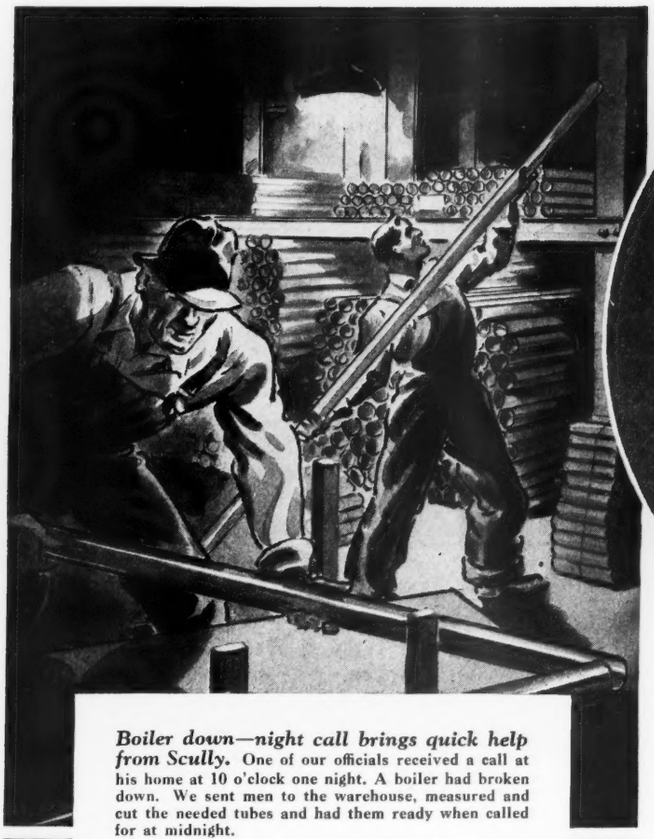
● Frigidaire Water Cooling Equipment is one of the soundest investments you can make in 1938. Day in and day out, year after year, it will pay you dividends. Dividends in comfort and health for the men on the job. And for you, dividends in goodwill, greater efficiency in every department—more production, fewer accidents.

Frigidaire equipment also gives you a tremendous saving in dollars and cents over old-style methods. A saving so great that Frigidaire actually pays for itself in a short time and continues to earn a big investment return for years to come. When we say "pays for itself" we mean just that. And we're ready to *prove* it to *you* by a FREE survey and estimate in your own plant.

It will pay you to get complete details. Find out how little it costs you and how much it saves you to have cool, sparkling water throughout your factory.

There is Frigidaire Water Cooling equipment for every need. Efficient, dependable, economical. *Investigate at once, and include Frigidaire equipment in your 1938 budget.* For free survey and estimate see your nearest Frigidaire Commercial dealer or drop a line to Frigidaire Division, General Motors Sales Corporation, Department 68-10, Dayton, Ohio.

FRIGIDAIRE
MADE ONLY BY GENERAL MOTORS



Boiler down—night call brings quick help from Scully. One of our officials received a call at his home at 10 o'clock one night. A boiler had broken down. We sent men to the warehouse, measured and cut the needed tubes and had them ready when called for at midnight.

"We must have it in the morning." Another emergency call came to us at 9 o'clock one night. Some Stainless Steel was needed for a rush job. We cut and delivered the order early the next morning.

IN EMERGENCIES TOO -call Scully

WHEN an emergency calls for steel or steel products in a hurry, prompt service will save you many dollars. When such an occasion arises, call Scully. We will meet that emergency.

And call Scully, too, for your regular requirements. We have huge stocks of steel, steel products, copper and brass in eight conveniently located warehouses. Try us.

Phone, write or wire the Scully warehouse nearest you. And send for our handy, complete Stock List and Reference Book. It's free, of course.

YOU'LL LIKE *Scully Service*

SCULLY STEEL PRODUCTS CO.

Warehouses at

CHICAGO • BOSTON • PITTSBURGH • NEWARK, N. J. • ST. LOUIS
BALTIMORE • ST. PAUL • CLEVELAND

UNITED STATES STEEL

HOW MANY SQUINTERS ARE

DON'T BLAME THE MEN. SIMPLY INSTALL NEW

TO END SQUINTING AND ASSURE EASIER, MORE

NEITHER, MY CHILD. HE IS SQUINTING, WHICH SHOWS THE TERRIBLE RESULTS OF THERMOMETER-ITIS*
IS THAT MAN SICK, FATHER? OR HAS HE SOMETHING IN HIS EYE?

***THERMOMETER-ITIS**—caused by trying to see temperatures on hard-to-read thermometers. Recognized by squinting... seeing temperatures that are not there... acting as if near-sighted... moving head and body from side to side when making a reading.

THERE IN YOUR PLANT?

TAYLOR INDUSTRIAL THERMOMETERS WITH BINOC TUBING

ACCURATE TEMPERATURE READINGS . . .

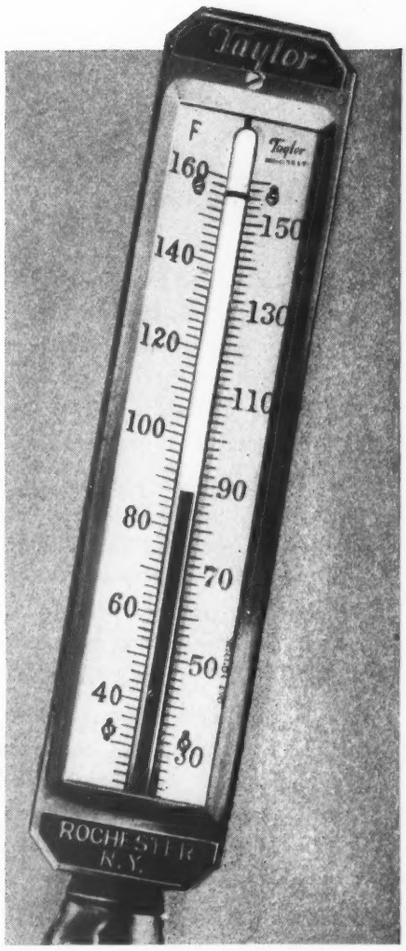
SQUINTING at industrial thermometers in order to read them correctly is old-fashioned.

Industrial thermometers that make squinting necessary are already out of date.

All this started when Taylor engineers introduced their new development—BINOC Tubing. A Taylor Thermometer with BINOC Tubing is the modern "read-as-you-go" thermometer. It eliminates "approximately correct" readings. It does away with "stop-stoop-squint" readings. It enables employees to read temperatures with both eyes wide open. And do it more accurately, more easily and naturally at greater distances from the thermometer than were customary before.

BINOC Tubing, with its optically correct, triple-lens construction, makes possible a thermometer with more than double the angle of vision within which the mercury column is clearly visible. It gives two to five times greater visibility than previous thermometers. It eliminates tricky bore reflections that cause inaccurate readings or waste time of employees.

If you have not tested the new Taylor Industrial Thermometers equipped with BINOC Tubing, it will pay you to do so at once. See how their use in your plant will do one more important thing to guard product quality and keep costs down. A Taylor Representative will present the complete story of this development which engineers have so thoroughly and quickly accepted. Or you can write for a demonstration direct to Taylor Instrument Companies, Rochester, N. Y. Plant also in Toronto, Canada.



No eye-strain from looking at this perfectly clear mercury column. BINOC Tubing in a Taylor Thermometer makes temperature reading as easy as reading the headline type of your favorite newspaper.

Taylor
INDUSTRIAL THERMOMETERS
with BINOC *tubing*
REG. U. S. PAT. OFF.

NEW FEVER THERMOMETERS WITH BINOC TUBING, TOO

After the development of BINOC Tubing for Industrial Thermometers Taylor turned its attention to the use of this remarkable product in fever thermometers. Taylor BINOC Fever Thermometers are now being introduced through the drug stores of the country. They have the same triple-lens construction that assures greater visibility. *They have shown that they are three times easier to read than other high quality fever thermometers.* The flattened tubing makes them easier to handle and more convenient to use. These remarkable new thermometers are as great an aid in the home as BINOC Industrial Thermometers are in industry.

If you want one of the new BINOC Fever Thermometers, and your druggist cannot supply you, just fill out the coupon, giving name of your regular druggist, and mail it with check or money order.

TAYLOR INSTRUMENT COMPANIES
Dept. F.M.M.-10, Rochester, N. Y.

I enclose {check / money order} for the BINOC Fever Thermometer (oral type, with case) checked here. My regular druggist is

_____
(Name of retail store—and address)

_____Taylor BINOC Fever Thermometer $1.50 each—
_____Taylor-Tycos BINOC Fever Thermometer $2.00 each

Name_____

Address_____

City_____ State_____

Busy? Then you'll need a FORD Screw Hoist

The Ford Screw Hoist pictured above is removing a gasoline engine. At the left it is being used to raise stack.

● Busy plants usually create more activity for the maintenance department—spotting machinery, changing drives, replacing motors or heavy parts—work that requires a Ford Screw Hoist.

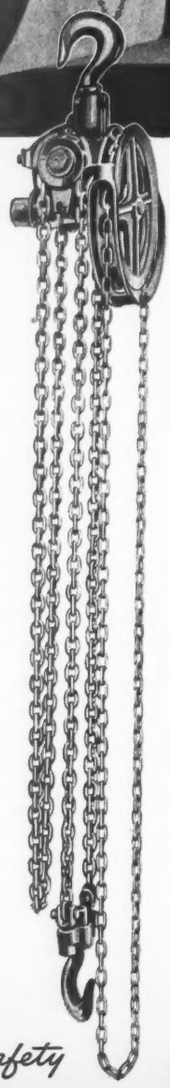
The Ford Screw Hoist is *light* in weight but *powerful*. It operates with a minimum of effort. Loads can be held securely at any point of suspension and lowered with exactness to a designated position. Non-fouling hand chain guide permits operation from any angle and prevents jerking or catching of the chain.

All Ford Screw Hoists are soundly designed and built. Load and hand chains are made from certified metals and each load chain link is heat treated and gauged for size. Every completed Ford hoist is tested to a 50% overload on the long ton basis.

Don't trust to luck for the safety of equipment and men or the economy of maintenance work—use a Ford Screw Hoist and be certain.

Made in capacities of ¼ to 10 tons.

FORD CHAIN BLOCK DIVISION
AMERICAN CHAIN & CABLE COMPANY, Inc.
PHILADELPHIA, PENNSYLVANIA



BUY ACCO QUALITY

A FEW OF THE 137 AMERICAN CHAIN & CABLE INDUSTRIAL PRODUCTS

AMERICAN CHAIN DIVISION
(DOMINION CHAIN COMPANY, Ltd., in Canada)
Weed Tire Chains • Welded and Weldless Chain • Malleable Castings • Railroad Specialties

AMERICAN CABLE DIVISION
Tru-Lay Preformed Wire Rope • Tru-Loc Processed Fittings • Crescent Brand Wire Rope Tru-Stop Brakes

ANDREW C. CAMPBELL DIVISION
Abrasive Cutting Machines • Floformers Special Machinery • Nibbling Machines

FORD CHAIN BLOCK DIVISION
Chain Hoists • Trolleys

HAZARD WIRE ROPE DIVISION
Green Strand Wire Rope • "Korodless" Wire Rope • Preformed Spring-Lay Wire Rope • Guard Rail Cable

HIGHLAND IRON & STEEL DIVISION
Wrought Iron Bars and Shapes

MANLEY MANUFACTURING DIVISION
Automotive Service Station Equipment

OWEN SILENT SPRING COMPANY, Inc.
Owen Cushion and Mattress Spring Centers

PAGE STEEL AND WIRE DIVISION
Page Fence • Wire and Rod Products Traffic Tape • Welding Wire

READING-PRATT & CADY DIVISION
Valves • Electric Steel Fittings

READING STEEL CASTING DIVISION
Electric Steel Castings, Rough or Machined

WRIGHT MANUFACTURING DIVISION
Chain Hoists • Electric Hoists and Cranes

In Business for Your Safety

ACCO

FORD Chain BLOCKS